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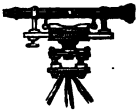
ENGINEER'S

FIELD BOOK.



BY

C. S. CROSS,

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RAILROAD CURVES.

The following tables show the distance from the point of intersection of the tangent lines to the beginning of one degree curve, the angle of deflection (=angle at centre) being known.

In the columns, under the head of degrees and opposite the minutes, are given the distances in feet from the intersection of tangents to the beginning of one degree curve.

To ascertain the distance for any given degree of curve, divide the distance given in the tables for a One degree curve, by the degrees of the required curve, and you have the distance from the point of intersection to the beginning or end of curve.

EXAMPLE:

Required the distance from the point of intersection of tangents to the beginning of a Two degrees curve, the angle of deflection being 25°.

In the tables under 25°, and opposite 0', find 1270.28 which divided by the degrees of the curve (2°) give 635.14 feet, the required distance.

In staking the centre line for a Rail-road or a canal, stakes should be driven down to near the surface of the ground, at the intersection of the tangents, and at the different stations; and nails set in indicating the centre point. These stakes serve also for leveling purposes and are useful in detecting errors while the work is being re-levelled and staked out.

The beginning and end of curves should have reference stakes set in at right angle to the centre line, similarly driven and marked, and at such convenient distance from the centre as will ensure them from being displaced in making excavations and embankments; and at all the above named points another stake for numbering, &c., should be firmly driven adjacent to them.

The radius of a One degree curve is 5730 feet. The circle being divided into 360 parts of one degree (equal angle of deflection) give 360 chords of one foot in length at the circumference, and also a radius of 57.3 ft. $\frac{360}{3.1416}=\frac{114.6}{2}=57.3$

The chord of One foot in length for 1 degree = 57.3 ft. Radius.
" 10 feet " " " = 573. 0 "
" 100 " " " " = 5730.0 "

Or the radius may be calculated by natural sines, thus:

sin. 1°: 100 ft. chord: sin. 89° 30′: 5730 ft. radius.

To determine the degree of curvature, having the radius given, divide the radius of a One degree curve, 5730, by the radius of the given curve.

EXAMPLE:

Required the degree of a curve having a radius of 1000 feet:

$$\frac{5730}{1000}=5^\circ 73=5^\circ 43' 48''$$

To determine the length of the curve having the angle of deflection given; divide the angle of deflection (=angle at centre) by the degrees of the curve, and you have the required length of the curve. If there are degrees and minutes in the angle of deflection, the minutes should be converted into decimals.—(*See page* 28.)

EXAMPLE:

The angle of deflection being 20° 49′, $\frac{49}{60}=0.816$. Then 20,816 is the distance for a One degree curve; if for a 2 degrees curve, divide this result by 2; for a 3 degrees curve, divide by three, and so on.

The angle of deflection being given, the following results are readily determined.

Angle of deflection.	Degree of curve.	Deflection per 100 feet.	Radius of curve.	Distance from intersection to beginning of curve.	Length of curve.
20° 49′	1°	0° 30′	5730.	1052.49	2081.6
20° 49′	2°	1° 00′	2865.	526.24	1040.8
20° 49′	3°	1° 30′	1910.	350.83	693.8
20° 49′	4°	2° 00′	1432.5	263.12	520.4
20° 49′	5°	2° 30′	1146.	210.50	416.3

To ascertain the radius of a curve, having the angle of deflection, and the distance from intersection to beginning of curve given. Find the distance for the angle of deflection in the tables, which divided by 5730. gives the natural tangent of half the angle.

Then divide the distance from intersection to beginning of curve by the natural tangent of half the angle, and you have the radius.

EXAMPLE:

Required the Radius of a curve, the angle of deflection being 20°, and the distance from intersection of tangents to beginning of curve 225 feet.

Under 20° and opposite 0′ in the tables, find 1010.37, which divided by 5730 feet gives the natural tangent 0.17633. Then 225 ft. divided by 0.17633 gives the radius 1276. feet.

FIELD NOTES FOR A ONE DEGREE CURVE.

Bearing of 1st tangent . . . . . . N. 20° W.
" 2d. " . . . . . . N. 40° W.
Angle of deflection by needle . . . . 20°
" " " graduated card . . . 20°

(The angles measured with the card are the most reliable; but the angles by the needle although it often indicates a slight difference, serves as a check to greater errors which may arise in reading the degrees on the graduated limb of the instrument.)

* Station No. 506.2000 Intersection of tangents.
— 10.1037 from intersec. to beginning of curve.

* Station No. 496.0963 point at which curve commences
+ 20.0000 length of curve.

* Station No. 516.0963 point at which curve terminates.

DEFLECTIONS FROM TANGENTS.

Stations.	Length of chords in feet.	Deflection from tangent.	REMARKS.
496.096	" "	" "	* Beginning of curve.
497.	90.37	0° 27	1° to left. (Tangent due N.)
498.	100.00	0° 57	
499.	100.00	1° 27	
500.	100.00	1° 57	
501.	100.00	2° 27	
502.	100.00	2° 57	* Change point.
503.	100.00	3° 27	
504.	100.00	3° 57	
505.	100.00	4° 27	
506.	100.00	4° 57	
507.	100.00	5° 27	
508.	100.00	5° 57	
509.	100.00	6° 27	* Change point.
510.	100.00	6° 57	
511.	100.00	7° 27	
512.	100.00	7° 57	
513.	100 00	8° 27	
514.	100.00	8° 57	
515.	100.00	9° 27	
516.	100.00	9° 57	
516.0963	9.63	10° 00	* End of curve. (Tangent N. 20° W.)

FIELD NOTES FOR A TWO DEGREES CURVE.

Bearing of 1st tangent . . . . . . N. 10° W.
" 2d " . . . . . . N. 30° W.

Angle of deflection by needle . . . . 20°
" " by graduated card . . . 20°

* Station . . 506.200 intersection of tangents.
— 5.052 from do. to beginning of curve.

* Station . . 501.148 point at which the curve commences.
+ 10.000 length of the curve.

* Station . . 511.148 point at which the curve terminates.

DEFLECTION FROM TANGENTS.

Stations.	Length of chords in feet.	Deflection from tangent.	REMARKS.
501.148	" "	0° 00	* Beginning of curve 2° to left.
502.	85.20	0° 51	(Tangent N. 10° W.)
503.	100.00	1° 51	
504.	100.00	2° 51	
505.	100.00	3° 51	
506.	100.00	4° 51	
507.	100.00	5° 51	* Change point.
508.	100.00	6° 51	
509.	100.00	7° 51	
510.	100.00	8° 51	
511.	100.00	9° 51	
511.148	14.80	10° 00	* End of curve. (Tangent N. 30° W.)

In curves of great length, the instrument should be moved forward in about every 5 or 6 hundred feet to insure accuracy, and often to avoid obstruction in line. The mode of proceeding in such cases may be illustrated with the deflections of the 2° curve.

The instrument in the first place is set at station 501.148 and the deflection from tangent to station 507 is 5° 51′. Now change the position of the instrument to station 507, and bring the cross hairs to bear on the staff at station 501.148; after clamping the instrument turn with the vernier as a test

for station	502,	0°51′	
for "	503,	1°51′	
for "	504,	2°51′	
for "	505,	3°51′	
and for the tangental station	507,	5°51′	* Ch. pt.

If the stakes are found to be correct, continue the setting of the remaining stakes to end of curve, and deflect the degrees from the beginning of curve given in the field notes opposite the respective stations.

When an odd number of minutes are to be turned off at the commencement and for each successive station, the inconvenience may be obviated by setting the vernier the number of minutes for the required chord in an opposite direction from that in which you would turn for the stations in the curve; or so that the instrument when set in line with the tangent and clamped, the nonius instead of reading 0, will indicate the number of degrees or minutes which would be deflected to strike in line with the first stake to be set in the curve. Then the remainder of the stations will be free from the odd minutes which would otherwise be turned off for each successive station.

When the instrument is moved forward to another station, the same mode may be adopted with reference to setting the nonius preparatory to bringing the cross hairs to bear on the staff at the beginning of curve.

By determining the tangents at the various points in the curve over which the instrument may be set, the staking of the curve may be prosecuted with less liability to error.

At the end of curve the instrument should be set over the stake to ascertain if the tangent produced from deflection corresponds with the course and direction of the tangential line.

Field Notes and method of staking a 3° Curve.

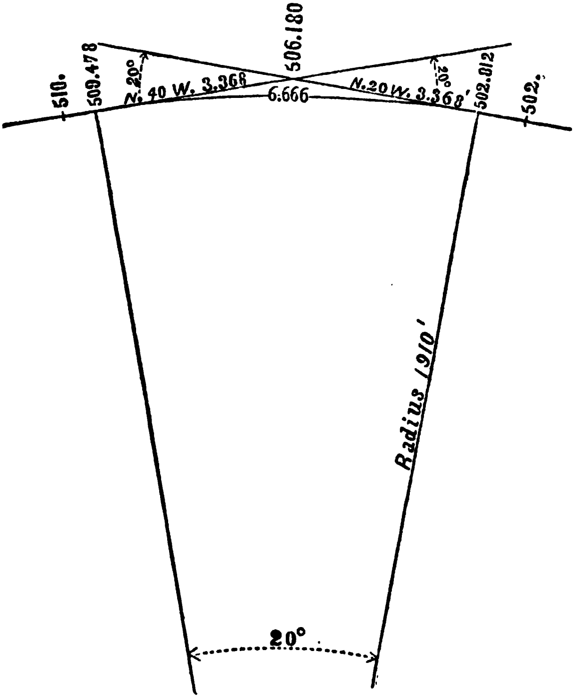
Bearing of 1st tangent, N. 20° W.
" 2d " N. 40° W.
Angle of deflection by needle 20°.
" " by graduated card 20°

* Station . . 506.180 intersection of tangents.
— 3.368 from do. do. to beginning of curve.

* Station . . 502.812 point at which the curve commences.
+ 6.666 length of curve.

* Station . . 509 478 point at which the curve terminates.

The notes are put down as represented in this diagram, and numbered from right to left when curving to the left, and from left to right when curving to the right



FIELD NOTES.

No. of Station.	Length of chords.	Course of tangents and chords.	Deflection from tangent.	REMARKS
502.812	" "	N. 20° W.	0° 0′	* B. C. 3° to left.
503.	18.8	20°17′	0° 17′	
504.	100	22. 04	1. 47	
505.	100	25. 04	3. 17	* Change point.
506.	100	28 04	4. 47	
507.	100	31. 04	6. 17	
508.	100	34. 04	7. 47	
509.	100	37. 04	9. 17	
509.478	47.8	39. 04	10. 00	* E. C.
510.	52.2	N. 40° 00 W.		

The number at which the curve ends should be given to the chainman before proceeding to measurement, so that the proper signal may be made by him on arriving at the station next preceding the termination of the curve.

Then set the instrument over the point of curve at station 502.812
and deflect from the tangent line for station 503, 0° 17′
" " 504, 1° 47′
" " 505, 3° 17′
and so on to the end of curve as per column of deflection, unless the instrument is moved forward. If it is necessary to move the instrument, then set it over another stake in the curve, bring the cross hairs to bear on the staff at the beginning of curve and clamp the instrument; then turn off for the tangent at the station selected, the same number of degrees originally turned from tangent at beginning of curve in setting the stake, and 1° 30′ additional for each successive station of 100 feet as you advance; the angles should correspond with those given in the column of deflections set opposite the respective stations.

It frequently occurs that the instrument has to be changed to points intermediate between two stations.

If in a five degrees curve, for instance, it is necessary to change the instrument from station No. 0, there being an obstruction in the line of sight between station 0 and station No. 3, and nothing to prevent the instrument being set over a point in the curve 30 feet distant from station 2; the deflections would be made as follows:

Station	0	Deflection =	0° 00 B. C. 5° R.	
"	1	"	2° 30.	
"	2	"	5° 00.	
"	2.30	"	5° 45.	* Change point.

Then move the instrument forward, and set it over station 2.30, and bring the cross hairs to bear on the staff at the beginning of the curve, station 0; then turn off 5° 45′ for tangent at station 2.30 and 1°.45′ for 70 feet the remainder of station No. 3, making in all for station No. 3—deflections 7° 30′
" 4 " 10° 00′
" 5 " 15° 00′ E. C.

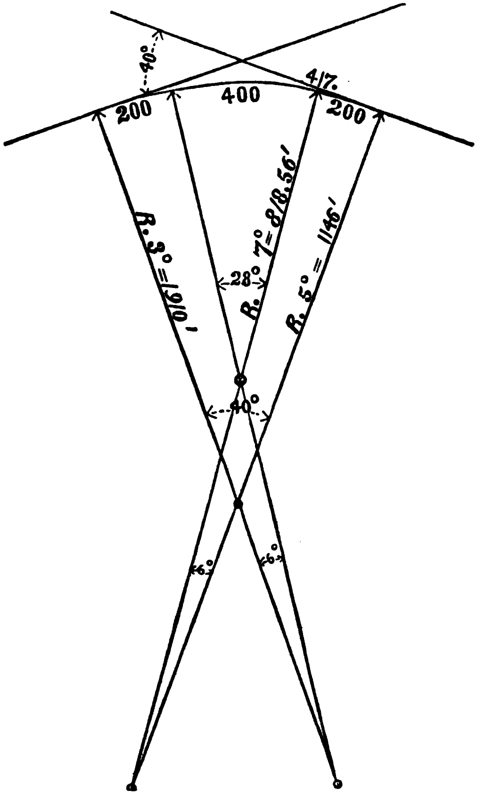
The angles for parts of a station on curves may be readily calculated, and the angles turned off in such manner as will keep the stations of uniform length throughout the line.

REVERSE CURVES.

These may be put in according to the formation of the ground with equal radii, or not, as the case may require. In the latter case the degree of curve may be assumed and the curve continued as far as deemed necessary; and the tangent is then produced to the intersection and measured—and the angle of deflection determined. These give the data from which the radius and degree of curve are determined.—*See page* 6 *and* 7.

In the former case select a point in one of the tangents and turn from tangent such angle as the case may require, and measure on this line the distance between the tangents. Then set in a point one half of this distance for the point of reversion, from which both curves may be staked out.—*See page* 6 *and* 7.

If you wish to compound a curve so that the trains will pass less abruptly from tangent into and through the curve, it may be done in the following manner:



We will assume the angle of deflection to be 40°; in the tables under 40° and opposite 0′ find 2085.55, the distance from intersection of tangents to beginning of a one degree curve.

If you wish to lay out a compound equivalent to a curve of 5° for the whole angle, divide the distance found (2085.55) by 5, degree of the curve; and you have the point of beginning 417 ft. from intersection of tangents. You will then decide on what length to substitute the less degree of curve.

If a 3° curve is decided on, and the distance 200 feet at each end of the 5° curve, then deduct 3° for each station of 100 feet, making 12° from the total angle of deflection, (40°) and you have 28° to be divided equally between the stations of the intermediate curve, or $\frac{28}{4}$= 7°, the required degree of curve.

FIELD NOTES.

No. of Station.	Course of Chords.	Deflection.	REMARKS.
No. 0	„ „	0° 00′	Beginning of curve, 3°
1	N 1° 30′ W	1° 30′	
2	4 30	3 00	End of curve, 3°, B. C. 7°.
3	9 30	3 30	From tangent.
4	16 30	7 00	
5	28 30	10 30	
6	30 30	14 00	E. C. 7°, B. C. 3°
7	35 30	1 30	From tangent.
8	38 30	3 00	E. C. 3° Tangent, N 40° W.

NATURAL TANGENTS.

From the tables may also be determined the natural tangent for any given number of degrees and minutes from One degree to 45°, by taking the distance given in the tables for twice the angle of which the tangent is sought, and dividing the same by 5730.

EXAMPLES:

1st. Required the natural tangent of 30°. Under 60° (twice the angle) find in the tables 3308.21 and divide the same by 5730, and you have the natural tangent for 30° = 0.57735.

2d. Required the natural tangent for an angle of 7° 28′; in the column of distances under 14° and opposite 56′ (twice the angle) find 750.97, which divided by 5730 give the natural tangent for 7° 28′ = 0.13106.

MEASUREMENT WITH GUNTER'S CHAIN.

When 66 feet chain is used for the length of stations, the radius of a one degree curve, 5730 feet, may represent 57.30 chains of 66 feet, and the distances in the tables applied the same as for chains of 100 feet in length; but the radius as well as the length of stations will be proportionally less than for stations of 100 feet in length by $\frac{1}{34}$ part.

If a 66 feet chain is used, the distance after being found in the tables, may be divided by 66, and the stations in the curve reduced to 75.76 links which are equal to 50 feet, one half the length of the stations generally adopted in staking the center line of railroads; and the curve staked out accordingly, turning off one half the number of degrees required for the stations of 100 feet in length.

The degree of curvature is understood to express the number of degrees per 100 feet, and hence the convenience of making the stations of such length as will give a definite idea of the degree of curve and length of radius.

The following abbreviations are used by some Engineers.

P. C.	For Point of	Curve, or Beginning of Curve.
P. T.	" " "	Tangent, or End of Curve.
P. C. C.	" " "	Compound Curve—or end of one curve and beginning of another, curving in the same direction.
P. R. C.	" " "	Reverse Curve, or point where the direction of the curve is changed from right to left, or *vice versa.*
P. I.	" " "	Intersection of Tangents.

RAILROAD CURVE TABLES.

RAILROAD CURVE TABLES.

′	0°	1°	2°	3°	4°	5°	6°	7°	8°	′
0	0.00	50.02	100.00	150.07	200.09	250.17	300.30	350.44	400.70	0
1	0.83	50.85	100.83	150.90	200.92	251.00	301.14	351.28	401.54	1
2	1.67	51.69	101.67	151.74	201.76	251.84	301.97	352.11	402.37	2
3	2.50	52.52	102.50	152.57	202.59	252.67	302.80	352.95	403.21	3
4	3.33	53.35	103.34	153.41	203.43	253.51	303.64	353.79	404.05	4
5	4.17	54.18	104.17	154.24	204.26	254.34	304.47	354.62	404.88	5
6	5.00	55.02	105.01	155.08	205.10	255.18	305.31	355.46	405.72	6
7	5.83	55.85	105.84	155.91	205.93	256.01	306.14	456.30	406.55	7
8	6.67	56.68	106.68	156.75	206.77	256.85	306.98	357.13	407.39	8
9	7.50	57.52	107.51	157.58	207.60	257.68	307.81	357.97	408.23	9
10	8.33	58.35	108.35	158.42	208.44	258.52	308.65	358.81	409.06	10
11	9.17	59.18	109.18	159.25	209.27	259.35	309.48	359.64	409.90	11
12	10.00	60.01	110.02	160.09	210.11	260.20	310.32	360.48	410.74	12
13	10.83	60.85	110.85	160.92	210.94	261.03	311.15	361.32	411.57	13
14	11.67	61.68	111.69	161.76	211.77	261.86	311.99	362.15	412.41	14
15	12.50	62.52	112.52	162.59	212.61	262.70	312.83	362.99	413.25	15
16	13.33	63.35	113.36	163.43	213.45	263.54	313.66	363.83	414.08	16
17	14.17	64.18	114.19	164.26	214.28	264.37	314.49	364.66	414.92	17
18	15.00	65.01	115.02	165.09	215.11	265.20	315.33	365.50	415.75	18
19	15.83	65.85	115.86	165.93	215.95	266.04	316.16	366.34	416.59	19
20	16.67	66.68	116.69	166.76	216.78	266.87	317.00	367.17	417.43	20
21	17.50	67.51	117.53	167.60	217.62	267.71	317.84	368.01	418.26	21
22	18.33	68.35	118.36	168.43	218.45	268.54	318.67	368.85	419.10	22
23	19.17	69.18	119.20	169.27	219.29	269.38	319.50	369.68	419.94	23
24	20.00	70.01	120.03	170.10	220.12	270.21	320.34	370.52	420.77	24
25	20.83	70.85	120.87	170.94	220.96	271.05	321.18	371.36	421.61	25
26	21.67	71.68	121.70	171.77	221.79	271.88	322.01	372.19	422.45	26
27	22.50	72.51	122.54	172.61	222.63	272.72	322.85	373.03	423.28	27
28	23.33	73.34	123.37	173.44	223.46	273.54	323.68	373.86	424.12	28
29	24.17	74.18	124.21	174.28	224.30	274.38	324.52	374.70	424.95	29
30	25.00	75.01	125.03	175.10	225.13	275.21	325.35	375.54	425.79	30
31	25.83	75.84	125.86	175.88	225.96	276.05	326.19	376.38	426.63	31
32	26.67	76.68	126.70	176.72	226.80	276.88	327.02	377.22	427.47	32
33	27.50	77.51	127.53	177.55	227.63	277.72	327.86	378.05	428.31	33
34	28.33	78.34	128.37	178.39	228.47	278.55	328.69	378.89	429.15	34
35	29.17	79.17	129.20	179.22	229.30	279.39	329.53	379.73	429.98	35
36	30.00	80.01	130.04	180.06	230.14	280.23	330.37	380.57	430.82	36
37	30.83	80.84	130.87	180.89	230.97	281.06	331.20	381.41	431.66	37
38	31.67	81.67	131.71	181.73	231.81	281.90	332.04	382.24	432.50	38
39	32.50	82.51	132.54	182.56	232.64	282.73	332.87	383.08	433.34	39
40	33.33	83.34	133.38	183.40	233.48	283.57	333.71	383.92	434.18	40
41	34.16	84.17	134.21	184.23	234.31	284.41	334.55	384.76	435.02	41
42	35.00	85.01	135.05	185.07	235.15	285.24	335.38	385.60	435.86	42
43	35.83	85.84	135.88	185.90	235.98	286.08	336.22	386.43	436·70	43
44	36.66	86.67	136.72	186.74	236.82	286.91	337.05	387.27	437.54	44
45	37.50	87.51	137.55	187.57	237.65	287.75	337.89	388.11	438.37	45
46	38.33	88.34	138.38	188.40	238.48	288.59	338.73	388.95	439.21	46
47	39.16	89.17	139.22	189.24	239.32	289.42	339.56	389.79	440.05	47
48	40.00	90.00	140.05	190.07	240.15	290.26	340.40	390.62	440.89	48
49	40.83	90.84	140.89	190.91	240.99	291.09	341.23	391.46	441.73	49
50	41.67	91.67	141.72	191.74	241.82	291.93	342.07	392.30	442.57	50
51	42.50	92.50	142.56	192.58	242.66	292.77	342.91	393.14	443.41	51
52	43.33	93.34	143.39	193.41	243.49	293.60	343.74	393.98	444.25	52
53	44.17	94.17	144.23	194.25	244.33	294.44	344.58	394.81	445.09	53
54	45.00	95.00	145.06	195.08	245.16	295.27	345.41	395.65	445.93	54
55	45.83	95.84	145.90	195.92	246.00	296.11	346.25	396.49	446.76	55
56	46.67	96.67	146.73	196.75	246.83	296.95	347.08	397.33	447.60	56
57	47.50	97.50	147.57	197.59	247.67	297.78	347.92	398.17	448.44	57
58	48.33	98.33	148.40	198.42	248.50	298.62	348.76	399.01	449.28	58
59	49.17	99.17	149.24	199.26	249.34	299.46	349.60	399.85	450.12	59

RAILROAD CURVE TABLES.

′	9°	10°	11°	12°	13°	14°	15°	16°	17°	′
0	450.95	501.32	551.74	602.22	652.87	703.53	754.35	805.29	856.35	0
1	451.79	502.16	552.58	603.06	653.71	704.38	755.20	809.14	857.20	1
2	452.63	503.00	553.42	603.91	654.56	705.23	756.05	806.99	858.05	2
3	453.47	503.84	554.26	604.75	655.40	706.07	756.89	807.84	858.90	3
4	454.31	504.68	555.10	605.60	656.25	706.92	757.74	808.64	859.76	4
5	455.14	505.52	555.94	606.44	657.09	707.77	758.59	809.54	860.61	5
6	455.98	506.36	556.78	607.28	657.93	708.62	759.44	810.39	861.46	6
7	456.82	507.20	557.62	608.13	658.78	709.47	760.29	811.24	862.31	7
8	457.66	508.04	558.46	608.97	659.62	710.31	761.13	812.09	863.16	8
9	458.50	508.88	559.30	609.82	660.47	711.16	761.98	812.94	864.01	9
10	459.34	509.72	560.14	610.66	661.31	712.01	762.83	813.79	864.87	10
11	460.18	510.56	560.98	611.50	662.15	712.86	763.68	814.64	865.72	11
12	461.02	511.40	561.82	612.35	663.00	713.71	764.53	815.49	866.57	12
13	461.86	512.24	562.66	613.19	663.84	714.55	765.37	816.34	867.42	13
14	462.70	513.08	563.50	614.04	664.69	715.40	766.22	817.19	868.27	14
15	463.53	513.92	564.34	614.88	665.53	716.25	767.07	818.04	869.12	15
16	464.37	514.76	565.18	615.72	666.37	717.10	767.92	818.89	869.98	16
17	465.21	515.60	566.02	616.57	667.22	717.95	768.77	819.74	870.83	17
18	466.05	516.44	566.86	617.41	668.06	718.79	769.61	820.59	871.68	18
19	466.89	517.28	567.70	618.26	668.91	719.64	770.46	821.44	872.53	19
20	467.73	518.12	568.54	619.10	669.75	720.49	771.31	822.29	873.38	20
21	468.57	518.96	569.38	619.94	670.59	721.35	772.16	823.14	874.23	21
22	469.41	519.80	570.22	620.79	671.44	722.20	773.01	823.99	875.09	22
23	470.25	520.64	571.06	621.63	672.28	723.04	773.85	824.84	875.94	23
24	471.08	521.48	571.90	622.48	673.13	723.89	774.70	825.69	876.79	24
25	471.92	522.32	572.74	623.32	673.97	724.74	775.55	826.54	877.64	25
26	472.76	523.16	573.58	624.16	674.81	725.59	776.40	827.39	878.49	26
27	473.60	524.01	574.42	625.01	675.66	726.44	777.25	828.24	879.34	27
28	474.43	524.85	575.27	625.85	676.51	727.28	778.09	829.09	880.20	28
29	475.26	525.69	576.11	626.70	677.35	728.13	778.94	829.94	881.05	29
30	476.10	526.53	576.95	627.55	678.20	728.97	779.79	830.79	881.90	30
31	476.94	527.37	577.79	628.39	679.04	729.82	780.64	831.64	882.75	31
32	477.78	528.21	578.63	629.24	679.89	730.66	781.49	832.49	883.61	32
33	478.62	529.05	579.48	630.08	680.73	731.51	782.34	833.35	884.46	33
34	479.46	529.89	580.32	630.93	681.58	732.35	783.19	834.20	885.32	34
35	480.30	530.73	581.16	631.77	682.42	733.20	784.04	835.05	886.17	35
36	481.14	531.57	582.00	632.61	683.26	734.05	784.89	835.90	887.02	36
37	481.99	532.41	582.84	633.46	684.11	734.89	785.74	836.75	887.88	37
38	482.83	533.25	583.69	634.30	684.95	735.74	786.59	837.61	888.73	38
39	483.67	534.09	584.53	635.15	685.80	736.58	787.44	838.46	889.59	39
40	484.51	534.93	585.37	635.99	686.64	737.43	788.29	839.31	890.44	40
41	485.35	535.77	586.21	636.83	687.48	738.28	789.14	840.16	891.29	41
42	486.19	536.61	587.05	537.68	688.33	739.12	789.99	841.01	892.15	42
43	487.03	537.45	587.90	638.52	689.17	739.97	790.84	841.87	893.00	43
44	487.87	538.29	588.74	639.37	690.02	740.81	791.69	842.72	893.86	44
45	488.71	539.13	589.58	640.21	690.86	741.66	792.54	843.57	894.71	45
46	489.56	539.97	590.42	641.05	691.70	742.51	793.39	844.42	895.56	46
47	490.40	540.81	591.26	641.90	692.55	743.35	794.24	845.27	896.42	47
48	491.24	541.65	592.11	642.74	693.39	744.20	795.09	846.13	897.27	48
49	492.08	542.49	592.95	643.59	694.24	745.04	795.94	846.98	898.13	49
50	492.92	543.33	593.79	644.43	695.08	745.89	796.79	847.83	898.98	50
51	493.76	544.17	594.63	645.27	695.92	746.74	797.64	848.68	899.83	51
52	494.60	545.01	595.47	646.12	696.77	747.58	798.49	849.53	900.69	52
53	495.44	545.85	596.32	646.96	697.61	748.43	799.34	850.39	901.54	53
54	496.28	546.69	597.16	647.81	698.46	749.27	800.19	851.24	902.40	54
55	497.12	547.53	598.00	648.65	699.30	750.12	801.04	852.09	903.25	55
56	497.96	548.37	598.84	649.49	700.14	750.97	801.89	852.94	904.10	56
57	498.81	549.21	599.68	650.34	700.99	751.81	802.74	853.79	904.96	57
58	499.65	550.06	690.53	651.18	701.83	752.66	803.59	854.65	905.81	58
59	500.48	550.90	601.38	652.03	702.68	753.50	804.44	855.50	906.67	59

RAILROAD CURVE TABLES.

′	18°	19°	20°	21°	22°	23°	24°	25°	26°	′
0	907.52	958.86	1010.37	1062.00	1113.80	1165.76	1217·96	1270.28	1322.88	0
1	908.38	959.72	1011.23	1062.86	1114.67	1166.63	1218.83	1271.16	1323.76	1
2	909.23	960.57	1012.09	1063.73	1115.53	1167.50	1219.70	1272.08	1324.63	2
3	910.09	961.43	1012.95	1064.59	1116.40	1168.37	1220.57	1272.91	1325.51	3
4	910.94	962.30	1013.81	1065.45	1117.26	1169.24	1221.45	1273.79	1326.39	4
5	911.80	963.15	1014.67	1066.32	1118.13	1170.11	1222.32	1274.66	1327.27	5
6	912.65	964.00	1015.53	1067.18	1118.99	1170.98	1223.19	1275.54	1328.14	6
7	913.51	964.86	1016.39	1068.04	1119.86	1171.85	1224.06	1276.42	1329.02	7
8	914.36	965.72	1017.24	1068.91	1120.72	1172.71	1224.93	1277.29	1329.90	8
9	915.22	966.58	1018.10	1069.77	1121.59	1173.58	1225.80	1278.17	1330.78	9
10	916.07	967.43	1018.96	1070.63	1122.45	1174.45	1226.67	1279.05	1331.65	10
11	916.93	968.29	1019.82	1071.50	1123.32	1175.32	1227.54	1279.92	1332.53	11
12	917.78	969.15	1020.68	1072.36	1124.18	1276.19	1228.42	1280.80	1333.41	12
13	918.64	970.00	1021.54	1073.22	1125.05	1177.06	1229.29	1281.69	1334.28	13
14	919.49	970.86	1022.40	1074.09	1125.91	1177.93	1230.16	1282.55	1335.16	14
15	920.35	971.72	1023.26	1074.95	1126.78	1178.80	1231.03	1283.43	1336.04	15
16	921.20	972.58	1024.12	1075.81	1127.64	1179.67	1231.90	1284.31	1336.92	16
17	922.06	973.43	1024.98	1076.68	1128.50	1180.54	1232.77	1285.18	1337.79	17
18	922.91	974.29	1025.84	1077.54	1129.37	1181.41	1233.64	1286.06	1338.67	18
19	923.77	975.15	1026.70	1078.40	1130.24	1182.28	1234.51	1286.94	1339.55	19
20	924.63	976.01	1027.56	1079.27	1131.10	1183.15	1235.39	1287.81	1340.43	20
21	925.48	976.86	1028.42	1080.13	1131.97	1184.02	1236.26	1288.69	1341.30	21
22	926.34	977.72	1029.27	1080.99	1132.83	1184.88	1237.13	1289.57	1342.18	22
23	927.19	978.58	1030.13	1081.86	1133.70	1185.75	1238.00	1290.44	1343.06	23
24	928.05	979.44	1030.99	1082.72	1134.56	1186.62	1238.87	1291.32	1343.94	24
25	928.90	980.29	1031.85	1083.58	1135.43	1187.49	1239.74	1292.20	1344.81	25
26	929.76	981.15	1032.71	1084.45	1136.29	1188.36	1240.61	1293.07	1345.69	26
27	930.61	982.01	1033.57	1085.31	1137.16	1189.23	1241.49	1293.95	1346.57	27
28	931.47	982.86	1034.43	1086.17	1138.02	1190.10	1242.36	1294.83	1347.44	28
29	932.32	983.72	1035.29	1087.04	1138.89	1190.97	1243.23	1295.70	1348.32	29
30	933.18	984.58	1036.15	1087.90	1139.75	1191.84	1244.10	1296.58	1349.20	30
31	934.04	985.44	1037.01	1088.76	1140.62	1192.71	1244.97	1297.46	1350.08	31
32	934.89	986.30	1037.87	1089.63	1141.48	1193.58	1245.85	1298.33	1350.96	32
33	935.75	987.16	1038.74	1090.49	1142.35	1194.45	1246.72	1299.21	1351.85	33
34	936.60	988.02	1039.60	1091.35	1143.22	1195.32	1247.59	1300.09	1352.73	34
35	937.46	988.88	1040.46	1092.22	1144.09	1196.19	1248.46	1300.96	1353.61	35
36	938.32	989.74	1041.32	1093.08	1144.95	1197.06	1249.34	1301.84	1354.49	36
37	939.17	990.60	1042.18	1093.94	1145.82	1197.93	1250.21	1302.72	1355.37	37
38	940.03	991.46	1043.05	1094.81	1146.69	1198.80	1251.08	1303.59	1356.25	38
39	940.88	992.32	1043.91	1095.67	1147.55	1199.68	1251.95	1304.47	1357.14	39
40	941.74	993.18	1044.77	1096.53	1148.42	1200.55	1252.83	1305.35	1358.02	40
41	942.60	994.04	1045.63	1097.40	1149.29	1201.42	1253.70	1306.22	1358.90	41
42	943.45	994.90	1046.49	1098.26	1150.15	1202.29	1254.57	1307.10	1359.78	42
23	944.31	995.76	1047.36	1099.12	1151.02	1203.16	1255.44	1307.98	1360.66	43
44	945.16	996.62	1048.22	1099.99	1151.89	1204.03	1256.32	1308.85	1361.54	44
45	946.02	997.48	1049.08	1100.85	1152.76	1204.90	1257.19	1309.73	1362.43	45
46	946.88	998.34	1049.94	1101.71	1153.62	1205.77	1258.06	1310.61	1363.31	46
47	947.73	999.19	1050.80	1102.58	1154.49	1206.64	1258.93	1311.48	1364.19	47
48	948.59	1000.05	1051.67	1103.44	1155.36	1207.51	1259.81	1312.36	1365.07	48
49	949.44	1000.91	1052.53	1104.30	1156.22	1208.38	1260.68	1313.24	1365.95	49
50	950.30	1001.77	1053.39	1105.17	1157.09	1209.25	1261.55	1314.11	1366.83	50
51	951.16	1002.63	1054.25	1106.03	1157.96	1210.12	1262.42	1314.99	1367.72	51
52	952.01	1003.49	1055.11	1106.89	1158.82	1210.99	1263.30	1315.87	1368.60	52
53	952.87	1004.35	1055.98	1107.76	1159.69	1211.86	1264.17	1316.74	1369.48	53
54	953.72	1005.21	1056.84	1108.62	1160.56	1212.73	1265.04	1317.62	1370.36	54
55	954.58	1006.07	1057.70	1109.48	1161.43	1213.61	1265.92	1318.50	1371.24	55
56	955.44	1006.93	1058.56	1110.35	1162.29	1214.48	1266.79	1319.37	1372.12	56
57	956.29	1007.79	1059.42	1111.21	1163.16	1215.35	1267.66	1320.25	1373.01	57
58	957.15	1008.65	1060.28	1112.07	1164.03	1216.22	1268.53	1321.13	1373.89	58
59	958.00	1009.51	1061.14	1112.94	1164.89	1217.09	1269.41	1322.00	1374.77	59

RAILROAD CURVE TABLES

′	27°	28°	29°	30°	31°	32°	33°	34°	35°	′
0	1375.65	1428.65	1481.89	1535.30	1589.04	1643.08	1697.28	1751.83	1806.67	0
1	1376.53	1429.54	1482.78	1536.20	1589.94	1643.98	1698.19	1752.74	1807.59	1
2	1377.41	1430.42	1483.67	1537.09	1590.84	1644.88	1699.10	1753.66	1808.50	2
3	1378.30	1431.31	1484.56	1537.99	1591.74	1645.78	1700.01	1754.57	1809.42	3
4	1379.18	1432.20	1485.45	1538.88	1592.64	1646.69	1700.92	1755.48	1810.34	4
5	1380.06	1433.08	1486.34	1539.78	1593.54	1647.59	1701.83	1756.40	1811.25	5
6	1380.94	1433.97	1487.23	1540.67	1594.44	1648.49	1702.74	1757.31	1812.17	6
7	1381.82	1434.86	1488.12	1541.57	1595.34	1649.39	1703.65	1758.22	1813.09	7
8	1382.70	1435.74	1489.01	1542.47	1596.24	1650.29	1704.55	1759.13	1814.00	8
9	1383.59	1436.63	1489.90	1543.36	1597.14	1651.19	1705.46	1760.05	1814.92	9
10	1384.47	1437.52	1490.79	1544.26	1598.04	1652.09	1706.37	1760.96	1815.84	10
11	1385.35	1438.40	1491.68	1545.15	1598.94	1652.99	1707.28	1761.87	1816.75	11
12	1386.23	1439.29	1492.57	1546.05	1599.84	1653.90	1708.19	1762.79	1817.67	12
13	1387.11	1440.18	1493.46	1546.94	1600.74	1654.80	1709.10	1763.70	1818.59	13
14	1387.99	1441.06	1494.35	1547.84	1601.64	1655.70	1710.01	1764.61	1819.50	14
15	1388.88	1441.95	1495.24	1548.74	1602.54	1656.60	1710.92	1765.53	1820.42	15
16	1389.76	1442.84	1496.13	1549.63	1603.44	1657.50	1711.83	1766.44	1821.34	16
17	1390.64	1443.72	1497.02	1550.53	1604.33	1658.40	1712.74	1767.35	1822.25	17
18	1391.52	1444.61	1497.91	1551.42	1605.23	1659.30	1713.65	1768.26	1823.17	18
19	1392.40	1445.50	1498.80	1552.32	1606.13	1660.20	1714.56	1769.18	1824.09	19
20	1393.28	1446.38	1499.69	1553.21	1607.03	1661.11	1715.47	1770.09	1825.00	20
21	1394.17	1447.27	1500.58	1554.11	1607.93	1662.01	1716.38	1771.00	1825.92	21
22	1395.05	1448.16	1501.47	1555.00	1608.83	1662.91	1717.28	1771.92	1826.84	22
23	1395.93	1449.04	1502.36	1555.90	1609.73	1663.81	1718.19	1772.83	1827.75	23
24	1396.81	1449.93	1503.25	1556.80	1610.63	1664.71	1719.10	1773.74	1828.67	24
25	1397.69	1450.82	1504.14	1557.69	1611.53	1665.61	1720.01	1774.66	1829.59	25
26	1398.57	1451.70	1505.03	1558.59	1612.43	1666.51	1720.92	1775.57	1830.50	26
27	1399.46	1452.59	1505.92	1559.48	1613.33	1667.42	1721.83	1776.48	1831.42	27
28	1400.34	1453.48	1506.81	1560.38	1614.23	1668.32	1722.74	1777.39	1832.34	28
29	1401.22	1454.36	1507.70	1561.28	1615.13	1669.22	1723.65	1778.31	1833.25	29
30	1402.10	1455.25	1508.59	1562.17	1616.03	1670.12	1724.56	1779.22	1834.17	30
31	1402.99	1456.14	1509.48	1563.07	1616.93	1671.03	1725.47	1780.14	1835.09	31
32	1403.87	1457.03	1510.37	1563.96	1617.83	1671.93	1726.38	1781.05	1836.01	32
33	1404.76	1457.91	1511.26	1564.86	1618.74	1672.84	1727.29	1781.97	1836.93	33
34	1405.64	1458.80	1512.15	1565.75	1619.64	1673.74	1728.20	1782.88	1837.85	34
35	1406.53	1459.69	1513.04	1566.65	1620.54	1674.65	1729.10	1783.80	1838.77	35
36	1407.41	1460.58	1513.93	1567.54	1621.44	1675.55	1730.01	1784.71	1839.69	36
37	1408.30	1461.47	1514.82	1568.44	1622.34	1676.46	1730.92	1785.63	1840.61	37
38	1409.18	1462.35	1515.71	1569.34	1623.24	1677.36	1731.83	1786.54	1841.54	38
39	1410.07	1463.24	1516.60	1570.23	1624.15	1678.27	1732.74	1787.46	1842.46	39
40	1410.95	1464.13	1517.49	1571.13	1625.05	1679.17	1733.65	1788.37	1843.38	40
41	1411.84	1465.02	1518.38	1572.02	1625.95	1680.08	1734.56	1789.29	1844.30	41
42	1412.72	1465.91	1519.27	1572.92	1626.85	1680.98	1735.47	1790.20	1845.22	42
43	1413.61	1466.79	1520.16	1573.81	1627.75	1681.89	1736.38	1791.12	1846.14	43
44	1414.49	1467.68	1521.05	1574.71	1628.65	1682.79	1737.29	1792.03	1847.06	44
45	1415.38	1468.57	1521.94	1575.61	1629.56	1683.70	1738.20	1792.95	1847.98	45
46	1416.26	1469.46	1522.83	1576.50	1630.46	1684.61	1739.10	1793.86	1848.90	46
47	1417.15	1470.35	1523.73	1577.40	1631.36	1685.51	1740.01	1794.78	1849.82	47
48	1418.03	1471.23	1524.62	1578.29	1632.26	1686.42	1740.92	1795.69	1850.74	48
49	1418.92	1472.12	1525.51	1579.19	1633.16	1687.32	1741.83	1796.61	1851.66	49
50	1419.80	1473.01	1526.40	1580.08	1634.06	1688.23	1742.74	1797.52	1852.58	50
51	1420.69	1473.90	1527.29	1580.98	1634.97	1689.13	1743.65	1798.44	1853.50	51
52	1421.57	1474.79	1528.18	1581.88	1635.87	1690.04	1744.56	1799.35	1854.43	52
53	1422.46	1475.67	1529.07	1582.77	1636.77	1690.94	1745.47	1800.27	1855.35	53
54	1423.34	1476.56	1529.96	1583.67	1637.67	1691.85	1746.38	1801.18	1856.27	54
55	1424.23	1477.45	1530.85	1584.56	1638.57	1692.75	1747.29	1802.10	1857.19	55
56	1425.11	1478.34	1531.74	1585.46	1639.47	1693.66	1748.19	1803.01	1858.11	56
57	1425.99	1479.23	1532.63	1586.35	1640.38	1694.56	1749.10	1803.93	1859.03	57
58	1426.88	1480.11	1533.52	1587.25	1641.28	1695.47	1750.01	1804.84	1859.95	58
59	1427.77	1481.00	1534.41	1588.15	1642.18	1696.87	1750.92	1805.76	1860.87	59

RAILROAD CURVE TABLES.

′	36°	37°	38°	39°	40°	41°	42°	43°	44°	′
0	1861.79	1917.26	1973.01	2029.11	2085.55	2142.33	2199.52	2257.10	2315.09	0
1	1862.71	1918.19	1973.94	2030.05	2086.50	2143.28	2200.48	2258.06	2316.06	1
2	1863.64	1919.11	1974.88	2030.99	2087.44	2144.24	2201.44	2259.03	2317.03	2
3	1864.56	1920.04	1975.81	2031.93	2088.39	2145.19	2202.40	2259.99	2318.00	3
4	1865.48	1920.97	1976.75	2032.87	2089.33	2146.14	2203.35	2260.96	2318.97	4
5	1866.41	1921.89	1977.68	2033.81	2090.28	2147.10	2204.31	2261.92	2319.94	5
6	1867.33	1922.82	1978.61	2034.75	2091.22	2148.05	2205.27	2262.89	2320.91	6
7	1868.25	1923.74	1979.55	2035.69	2092.17	2149.00	2206.23	2263.85	2321.88	7
8	1869.17	1924.67	1980.48	2036.63	2093.11	2149.95	2207.19	2264.82	2322.85	8
9	1870.10	1925.60	1981.42	2037.57	2094.06	2150.91	2208.15	2265.78	2323.82	9
10	1871.02	1926.52	1982.35	2038.51	2095.00	2151.86	2209.11	2266.75	2324.79	10
11	1871.94	1927.45	1983.28	2039.45	2095.95	2152.81	2210.07	2267.71	2325.76	11
12	1872.86	1928.38	1984.22	2040.39	2096.89	2153.77	2211.02	2268.68	2326.73	12
13	1873.78	1929.30	1985.15	2041.33	2097.84	2154.72	2211.98	2269.64	2327.70	13
14	1874.71	1930.23	1986.09	2042.27	2098.78	2155.67	2212.94	2270.61	2328.67	14
15	1875.63	1931.15	1987.02	2043.21	2099.73	2156.63	2213.90	2271.57	2329.64	15
16	1876.55	1932.08	1987.95	2044.15	2100.67	2157.58	2214.86	2272.54	2330.61	16
17	1877.48	1933.01	1988.89	2045.08	2101.62	2158.53	2215.82	2273.50	2331.59	17
18	1878.40	1933.93	1989.82	2046.02	2102.57	2159.48	2216.78	2274.46	2332.56	18
19	1879.32	1934.86	1990.76	2046.96	2103.51	2160.44	2217.74	2275.43	2333.52	19
20	1880.24	1935.79	1991.69	2047.90	2104.46	2161.39	2218.69	2276.39	2334.49	20
21	1881.16	1936.71	1992.62	2048.84	2105.40	2162.34	2219.65	2277.36	2335.46	21
22	1882.09	1937.64	1993.56	2049.78	2106.35	2163.30	2220.61	2278.32	2336.44	22
23	1883.01	1938.56	1994.49	2050.72	2107.29	2164.25	2221.57	2279.29	2337.41	23
24	1883.93	1939.49	1995.43	2051.66	2108.24	2165.20	2222.53	2280.25	2338.38	24
25	1884.86	1940.42	1996.36	2052.60	2109.18	2166.16	2223.49	2281.22	2339.35	25
26	1885.78	1941.34	1997.29	2053.54	2110.13	2167.11	2224.45	2282.18	2340.32	26
27	1886.71	1942.27	1998.23	2054.48	2111.07	2168.06	2225.40	2283.15	2341.29	27
28	1887.63	1943.20	1999.16	2055.42	2112.02	2169.01	2226.36	2284.11	2342.26	28
29	1888.55	1944.12	2000.10	2056.36	2112.96	2169.97	2227.32	2285.08	2343.23	29
30	1889.47	1945.05	2001.03	2057.30	2113.91	2170.92	2228.28	2286.04	2344.20	30
31	1890.40	1945.98	2001.97	2058.24	2114.86	2171.87	2229.24	2287.01	2345.17	31
32	1891.32	1946.91	2002.90	2059.18	2115.80	2172.83	2230.20	2287.98	2346.15	32
33	1892.25	1947.85	2003.84	2060.13	2116.75	2173.78	2231.16	2288.94	2347.12	33
34	1893.17	1948.78	2004.77	2061.07	2117.70	2174.73	2232.12	2289.91	2348.10	34
35	1894.10	1949.71	2005.71	2062.01	2118.65	2175.69	2233.08	2290.88	2349.07	35
36	1895.03	1950.64	2006.65	2062.95	2119.59	2176.64	2234.04	2291.85	2350.04	36
37	1895.95	1951.57	2007.58	2063.89	2120.54	2177.59	2235.00	2292.82	2351.02	37
38	1896.88	1952.51	2008.52	2064.83	2121.49	2178.55	2235.97	2293.79	2351.99	38
39	1897.81	1953.44	2009.45	2065.78	2122.44	2179.50	2236.93	2294.75	2352.97	39
40	1898.73	1954.37	2010.39	2066.72	2123.38	2180.45	2237.89	2295.72	2353.94	40
41	1899.66	1955.30	2011.33	2067.66	2124.33	2181.41	2238.85	2296.69	2354.91	41
42	1900.59	1956.23	2012.26	2068.60	2125.28	2182.36	2239.81	2297.66	2355.89	42
43	1901.51	1957.17	2013.20	2069.54	2126.22	2183.31	2240.77	2298.63	2356.86	43
44	1902.44	1958.10	2014.34	2070.48	2127.17	2184.27	2241.73	2299.60	2357.84	44
45	1903.36	1959.03	2015.07	2071.43	2128.12	2185.22	2242.69	2300.56	2358.81	45
46	1904.29	1959.96	2016.01	2072.37	2129.07	2186.17	2243.65	2301.53	2359.78	46
47	1905.22	1960.89	2016.94	2073.31	2130.01	2187.13	2244.61	2302.50	2360.76	47
48	1906.14	1961.83	2017.88	2074.25	2130.96	2188.08	2245.57	2303.47	2361.73	48
49	1907.07	1962.76	2018.81	2075.19	2131.91	2189.03	2246.53	2304.44	2362.71	49
50	1908.00	1963.69	2019.75	2076.13	2132.86	2189.99	2247.49	2305.41	2363.68	50
51	1908.92	1964.62	2020.69	2077.08	2133.80	2190.94	2248.45	2306.37	2364.65	51
52	1909.85	1965.55	2021.62	2078.02	2134.75	2191.89	2249.42	2307.34	2365.63	52
53	1910.77	1966.49	2022.56	2078.99	2135.70	2192.85	2250.38	2308.31	2366.60	53
54	1911.70	1967.42	2023.49	2079.90	2136.65	2193.80	2251.34	2309.28	2367.58	54
55	1912.63	1968.35	2024.43	2080.84	2137.59	2194.75	2252.30	2310.25	2368.55	55
56	1913.55	1969.28	2025.37	2081.78	2138.54	2195.71	2253.26	2311.22	2369.52	56
57	1914.48	1970.21	2026.30	2082.73	2139.49	2196.66	2254.22	2312.18	2370.50	57
58	1915.41	1971.15	2027.24	2083.67	2140.43	2197.61	2255.18	2313.15	2371.47	58
59	1916.33	1972.08	2028.17	2084.61	2141.38	2198.57	2256.14	2314.21	2372.45	59

RAILROAD CURVE TABLES.

′	45°	46°	47°	48°	49°	50°	51°	52°	53°	′
0	2373.42	2432.21	2491.46	2551.11	2611.27	2671.90	2733.04	2794.69	2856.86	0
1	2374.40	2433.20	2492.45	2552.11	2612.28	2672.92	2734.07	2795.72	2857.90	1
2	2375.38	2434.18	2493.45	2553.11	2613.29	2673.94	2735.09	2796.76	2858.95	2
3	2376.35	2435.17	2494.44	2554.11	2614.30	2674.95	2736.12	2797.79	2859.99	3
4	2377.33	2436.15	2495.43	2555.11	2615.31	2675.97	2737.14	2798.82	2861.03	4
5	2378.31	2437.14	2496.43	2556.11	2616.32	2676.99	2738.17	2799.86	2862.08	5
6	2379.29	2438.12	2497.42	2557.12	2617.32	2678.01	2739.19	2800.89	2863.12	6
7	2380.27	2439.11	2498.41	2558.12	2618.33	2679.03	2740.22	2801.92	2864.16	7
8	2381.24	2440.10	2499.40	2559.12	2619.34	2680.04	2741.25	2802.96	2865.20	8
9	2382.22	2441.08	2500.40	2560.12	2620.35	2681.06	2742.27	2803.99	2866.25	9
10	2383.20	2442.07	2501.39	2561.12	2621.36	2682.08	2743.30	2805.02	2867.29	10
11	2384.18	2443.05	2502.38	2562.12	2622.36	2683.10	2744.32	2806.06	2868.33	11
12	2385.16	2444.04	2503.38	2563.12	2623.37	2684.12	2745.35	2807.09	2869.38	12
13	2386.13	2445.02	2504.37	2564.12	2624.38	2685.13	2746.37	2808.12	2870.42	13
14	2387.11	2446.01	2505.36	2565.12	2625.39	2686.15	2747.40	2809.16	2871.46	14
15	2388.09	2447.00	2506.36	2566.12	2626.40	2687.17	2748.43	2810.19	2872.51	15
16	2389.07	2447.98	2507.35	2567.13	2627.41	2688.19	2749.45	2811.22	2873.55	16
17	2390.05	2448.97	2508.34	2568.13	2628.41	2689.21	2750.48	2812.26	2874.59	17
18	2391.02	2449.95	2509.33	2569.13	2629.42	2690.22	2751.50	2813.29	2875.63	18
19	2392.00	2450.94	2510.33	2570.13	2630.43	2691.24	2752.53	2814.32	2876.68	19
20	2392.98	2451.92	2511.32	2571.13	2631.44	2692.26	2753.55	2815.36	2877.72	20
21	2393.96	2452.91	2512.32	2572.13	2632.45	2693.28	2754.58	2816.39	2878.76	21
22	2394.94	2453.89	2513.31	2573.13	2633.46	2694.30	2755.61	2817.42	2879.81	22
23	2395.91	2454.88	2514.30	2574.13	2634.47	2695.31	2756.63	2818.46	2880.85	23
24	2396.89	2455.87	2515.30	2575.13	2635.48	2696.33	2757.66	2819.49	2881.89	24
25	2397.87	2456.85	2516.29	2576.13	2636.49	2697.35	2758.68	2820.52	2882.94	25
26	2398.85	2457.84	2517.28	2577.13	2637.50	2698.37	2759.71	2821.56	2883.98	26
27	2399.83	2458.82	2518.27	2578.13	2638.50	2699.39	2760.73	2822.59	2885.02	27
28	2400.80	2459.81	2519.27	2579.13	2639.51	2700.40	2761.76	2823.62	2886.06	28
29	2401.78	2460.80	2520.26	2580.13	2640.52	2701.42	2762.79	2824.66	2887.11	29
30	2402.76	2461.78	2521.25	2581.13	2641.53	2702.44	2763.81	2825.69	2888.15	30
31	2403.74	2462.77	2522.25	2582.13	2642.54	2703.46	2764.84	2826.73	2889.20	31
32	2404.72	2463.76	2523.24	2583.14	2643.55	2704.48	2765.87	2827.77	2890.24	32
33	2405.71	2464.75	2524.24	2584.14	2644.57	2705.50	2766.90	2828.81	2891.29	33
34	2406.69	2465.74	2525.23	2585.15	2645.58	2706.52	2767.93	2829.85	2892.34	34
35	2407.67	2466.73	2526.23	2586.15	2646.59	2707.54	2768.96	2830.89	2893.39	35
36	2408.65	2467.72	2527.22	2587.16	2647.60	2708.56	2769.99	2831.92	2894.43	36
37	2409.63	2468.71	2528.22	2588.16	2648.62	2709.58	2771.02	2832.96	2895.48	37
38	2410.61	2469.69	2529.21	2589.17	2649.63	2710.60	2772.04	2834.00	2896.53	38
39	2411.60	2470.68	2530.21	2590.17	2650.64	2711.62	2773.07	2835.04	2897.57	39
40	2412.58	2471.67	2531.20	2591.18	2651.65	2712.64	2774.10	2836.08	2898.62	40
41	2413.56	2472.66	2532.20	2592.18	2652.67	2713.66	2775.13	2837.12	2899.67	41
42	2414.54	2473.65	2533.19	2593.18	2653.68	2714.68	2776.16	2838.16	2900.71	42
43	2415.52	2474.64	2534.19	2594.19	2654.69	2715.70	2777.19	2839.20	2901.76	43
44	2416.50	2475.63	2535.18	2595.19	2655.70	2716.72	2778.22	2840.24	2902.81	44
45	2417.49	2476.62	2536.18	2596.20	2656.71	2717.74	2779.25	2841.28	2903.86	45
46	2418.47	2477.61	2537.17	2597.20	2657.73	2718.76	2780.28	2842.31	2904.90	46
47	2419.45	2478.60	2538.17	2598.21	2658.74	2719.78	2781.31	2843.35	2905.95	47
48	2420.43	2479.59	2539.17	2599.21	2659.75	2720.80	2782.34	2844.39	2907.00	48
49	2421.41	2480.58	2540.16	2600.22	2660.76	2721.82	2783.37	2845.43	2908.04	49
50	2422.39	2481.57	2541.16	2601.22	2661.78	2722.84	2784.40	2846.47	2909.09	50
51	2423.38	2482.56	2542.15	2602.23	2662.79	2723.86	2785.43	2747.51	2910.14	51
52	2424.36	2483.54	2543.15	2603.23	2663.80	2724.88	2786.45	2848.55	2911.18	52
53	2425.34	2484.53	2544.14	2604.24	2664.81	2725.90	2787.48	2849.59	2912.23	53
54	2426.32	2485.52	2545.14	2605.24	2665.83	2726.92	2788.51	2850.63	2913.28	54
55	2427.30	2486.51	2546.13	2606.24	2666.84	2727.94	2789.54	2851.67	2914.32	55
56	2428.28	2487.50	2547.13	2607.25	2667.85	2728.96	2790.57	2852.70	2915.36	56
57	2429.27	2488.49	2548.12	2608.25	2668.86	2729.98	2791.60	2853.74	2916.41	57
58	2430.25	2489.48	2549.12	2609.26	2669.87	2731.00	2792.63	2854.78	2917.46	58
59	2431.23	2490.47	2550.11	2610.26	2670.89	2732.02	2793.66	2855.82	2918.50	59

RAILROAD CURVE TABLES.

′	54°	55°	56°	57°	58°	59°	60°	61°	62°	′
0	2919.55	2982.81	3046.64	3111.10	3176.14	3241.86	3308.21	3375.20	3442.93	0
1	2920.60	2983.87	3047.71	3112.18	3177.23	3242.96	3309.32	3376.33	3444.07	1
2	2921.65	2984.93	3048.78	3113.26	3178.32	3244.06	3310.44	3377.45	3445.20	2
3	2922.71	2986.00	3049.86	3114.34	3179.42	3245.17	3311.55	3378.58	3446.34	3
4	2923.76	2987.06	3050.93	3115.42	3180.51	3246.27	3312.67	3379.70	3447.48	4
5	2924.81	2988.12	3052.00	3116.51	3181.60	3247.37	3313.78	3380.83	3448.61	5
6	2925.86	2989.18	3053.07	3117.59	3182.69	3248.47	3314.89	3381.95	3449.75	6
7	2926.92	2990.24	3054.14	3118.67	3183.79	3249.57	3316.01	3383.08	3450.88	7
8	2927.97	2991.31	3055.21	3119.75	3184.88	3250.68	3317.12	3384.20	3452.02	8
9	2929.02	2992.37	3056.29	3120.83	3185.97	3251.78	3318.24	3385.33	3453.16	9
10	2930.07	2993.43	3057.36	3121.91	3187.06	3252.88	3319.35	3386.45	3454.29	10
11	2931.13	2994.49	3058.43	3122.99	3188.16	3253.98	3320.46	3387.58	3455.43	11
12	2932.18	2995.55	3059.50	3124.07	3189.25	3255.08	3321.58	3388.70	3456.57	12
13	2933.23	2996.62	3060.57	3125.15	3190.34	3256.19	3322.69	3389.83	3457.70	13
14	2934.28	2997.68	3061.64	3126.23	3191.43	3257.29	3323.80	3390.95	3458.84	14
15	2935.33	2998.74	3062.72	3127.32	3192.52	3258.39	3324.92	3392.08	3459.97	15
16	2936.39	2999.80	3063.79	3128.40	3193.62	3259.49	3326.03	3393.20	3461.11	16
17	2937.44	3000.86	3064.86	3129.48	3194.71	3260.59	3327.15	3394.33	3462.25	17
18	2938.49	3001.93	3065.93	3130.56	3195.80	3261.70	3328.26	3395.45	3463.38	18
19	2939.54	3002.99	3067.00	3131.64	3196.89	3262.80	3329.36	3396.58	3464.52	19
20	2940.60	3004.05	3068.07	3132.72	3197.99	3263.90	3330.49	3397.70	3465.66	20
21	2941.65	3005.11	3069.15	3133.80	3199.08	3265.00	3331.60	3398.83	3466.79	21
22	2942.70	3006.17	3070.22	3134.88	3200.17	3266.10	3332.71	3399.95	3467.93	22
23	2943.75	3007.24	3071.29	3135.96	3201.26	3267.21	3333.83	3401.08	3469.07	23
24	2944.81	3008.30	3072.36	3137.04	3202.36	3268.31	3334.94	3402.20	3470.20	24
25	2945.86	3009.36	3073.43	3138.13	3203.45	3269.41	3336.05	3403.33	3471.34	25
26	2946.91	3010.42	3074.50	3139.21	3204.54	3270.51	3337.17	3404.45	3472.47	26
27	2947.96	3011.48	3075.58	3140.29	3205.63	3271.61	3338.28	3405.58	3473.61	27
28	2949.01	3012.55	3076.65	3141.37	3206.73	3272.72	3339.40	3406.70	3474.75	28
29	2950.07	3013.61	3077.72	3142.45	3207.82	3273.82	3340.51	3407.83	3475.88	29
30	2951.12	3014.67	3078.79	3143.53	3208.91	3274.92	3341.62	3408.95	3477.02	30
31	2952.18	3015.74	3079.87	3144.62	3210.01	3276.03	3342.74	3410.08	3478.16	31
32	2953.23	3016.80	3080.94	3145.70	3211.11	3277.14	3343.86	3411.22	3479.31	32
33	2954.29	3017.87	3082.02	3146.79	3212.20	3278.25	3344.98	3412.35	3480.45	33
34	2955.35	3018.93	3083.10	3147.88	3213.30	3279.36	3346.10	3413.48	3481.60	34
35	2956.40	3020.00	3084.18	3148.97	3214.40	3280.47	3347.22	3414.61	3482.74	35
36	2957.46	3021.06	3085.25	3150.05	3215.50	3281.58	3348.34	3415.75	3483.88	36
37	2958.51	3022.13	3086.33	3151.14	3216.60	3282.69	3349.46	3416.88	3485.03	37
38	2959.57	3023.20	3087.41	3152.23	3217.70	3283.80	3350.58	3418.01	3486.17	38
39	2960.63	3024.26	3088.48	3153.31	3218.80	3284.91	3351.69	3419.14	3487.32	39
40	2961.68	3025.33	3089.56	3154.40	3219.89	3286.02	3352.81	3420.28	3488.46	40
41	2962.74	3026.39	3090.64	3155.49	3220.99	3287.13	3353.93	3421.41	3489.60	41
42	2963.80	3027.46	3091.71	3156.57	3222.09	3288.24	3355.05	3422.54	3490.75	42
43	2964.85	3028.52	3092.79	3157.66	3223.19	3289.35	3356.17	3423.68	3491.89	43
44	2965.91	3029.59	3093.87	3158.75	3224.29	3290.46	3357.29	3424.81	3493.04	44
45	2966.96	3030.66	3094.95	3159.84	3225.38	3291.57	3358.41	3425.94	3494.18	45
46	2968.02	3031.72	3096.02	3160.92	3226.48	3292.68	3359.53	3427.07	3495.32	46
47	2969.08	3032.79	3097.10	3162.01	3227.58	3293.78	3360.65	3428.21	3496.47	47
48	2970.13	3033.85	3098.18	3163.10	3228.68	3294.89	3361.77	3429.34	3497.61	48
49	2971.19	3034.92	3099.25	3164.18	3229.78	3296.00	3362.89	3430.47	3498.77	49
50	2972.25	3035.98	3100.33	3165.27	3230.88	3297.11	3364.01	3431.60	3499.90	50
51	2973.30	3037.05	3101.41	3166.36	3231.97	3298.22	3365.13	3432.74	3501.04	51
52	2974.36	3038.11	3102.48	3167.44	3233.07	3299.33	3366.25	3433.87	3502.19	52
53	2975.41	3039.18	3103.56	3168.53	3234.17	3300.44	3367.37	3435.00	3503.33	53
54	2976.47	3040.25	3104.64	3169.62	3235.27	3301.55	3368.48	3436.13	3504.48	54
55	2977.53	3041.31	3105.72	3170.71	3236.37	3302.66	3369.60	3437.27	3505.62	55
56	2978.58	3042.38	3106.79	3171.79	3237.47	3303.77	3370.72	3438.40	3506.76	56
57	2979.64	3043.44	3107.87	3172.88	3238.56	3304.88	3371.84	3439.53	3507.91	57
58	2980.70	3044.51	3108.95	3173.97	3239.66	3305.99	3372.96	3440.67	3509.05	58
59	2981.75	3045.57	3110.02	3175.05	3240.76	3307.10	3374.08	3441.80	3510.20	59

RAILROAD CURVE TABLES.

′	63°	64°	65°	66°	67°	68°	69°	70°	71°	′
0	3511.34	3580.45	3650.41	3721.06	3792.57	3864.88	3938.11	4012.15	4087.15	0
1	3512.49	3581.61	3651.59	3722.25	3793.77	3866.10	3939.34	4013.40	4088.41	1
2	3513.64	3582.78	3652.76	3723.44	3794.97	3867.31	3940.57	4014.64	4089.67	2
3	3514.78	3583.94	3653.94	3724.62	3796.17	3868.53	3941.80	4015.89	4090.93	3
4	3515.93	3585.10	3655.11	3725.81	3797.38	3869.75	3943.03	4017.14	4092.19	4
5	3517.08	3586.27	3656.29	3727.00	3798.58	3870.97	3944.26	4018.39	4093.45	5
6	3518.23	3587.43	3657.46	3728.19	3799.78	3872.18	3945.49	4019.63	4094.71	6
7	3519.38	3588.59	3658.64	3729.38	3800.98	3873.40	3946.72	4020.88	4095.97	7
8	3520.52	3589.75	3659.81	3730.56	3802.18	3874.62	3947.95	4022.13	4097.24	8
9	3521.67	3590.92	3660.99	3731.75	3803.38	3875.83	3949.18	4023.37	4098.50	9
10	3522.82	3592.08	3662.16	3732.94	3804.58	3877.05	3950.41	4024.62	4099.76	10
11	3523.97	3593.24	3663.33	3734.13	3805.78	3878.27	3951.64	4025.87	4101.02	11
12	3525.12	3594.41	3664.51	3735.32	3806.99	3879.48	3952.87	4027.11	4102.28	12
13	3526.26	3595.57	3665.68	3736.50	3808.19	3880.70	3954.10	4028.36	4103.54	13
14	3527.41	3596.73	3666.86	3737.69	3809.39	3881.92	3955.33	4029.61	4104.80	14
15	3528.56	3597.90	3668.03	3738.88	3810.59	3883.14	3956.56	4030.86	4106.06	15
16	3529.71	3599.06	3669.21	3740.07	3811.79	3884.35	3957.79	4032.10	4107.32	16
17	3530.86	3600.22	3670.38	3741.26	3812.99	3885.57	3959.02	4033.35	4108.58	17
18	3532.00	3601.38	3671.56	3742.44	3814.19	3886.79	3960.25	4034.60	4109.84	18
19	3533.15	3602.55	3672.73	3743.63	3815.39	3888.00	3961.48	4035.84	4111.10	19
20	3534.30	3603.71	3673.90	3744.82	3816.60	3889.21	3962.71	4037.09	4112.36	20
21	3535.45	3604.87	3675.08	3746.01	3817.80	3890.43	3963.94	4038.34	4113.62	21
22	3536.60	3606.04	3676.25	3747.20	3819.00	3891.64	3965.17	4039.58	4114.89	22
23	3537.74	3607.20	3677.43	3748.38	3820.20	3892.86	3966.40	4040.83	4116.15	23
24	3538.89	3608.36	3678.60	3749.57	3821.40	3894.08	3967.63	4042.08	4117.41	24
25	3540.04	3609.53	3679.78	3750.76	3822.60	3895.29	3968.86	4043.33	4118.67	25
26	3541.19	3610.69	3680.95	3751.95	3823.80	3896.51	3970.09	4044.57	4119.93	26
27	3542.34	3611.85	3682.13	3753.14	3825.01	3897.73	3971.32	4045.82	4121.19	27
28	3543.48	3613.01	3683.30	3754.32	3826.21	3898.95	3972.55	4047.07	4122.45	28
29	3544.63	3614.18	3684.48	3755.51	3827.41	3900.16	3973.78	4048.31	4123.71	29
30	3545.78	3615.34	3685.65	3756.70	3828.61	3901.38	3975.01	4049.56	4124.97	30
31	3546.94	3616.51	3686.83	3757.90	3829.82	3902.60	3976.25	4050.81	4126.24	31
32	3548.09	3617.68	3688.01	3759.09	3831.03	3903.83	3977.49	4052.07	4127.51	32
33	3549.25	3618.85	3689.19	3760.29	3832.24	3905.05	3978.72	4053.32	4128.78	33
34	3550.40	3620.02	3690.37	3761.48	3833.45	3906.28	3979.96	4054.57	4130.05	34
35	3551.56	3621.19	3691.55	3762.68	3834.66	3907.50	3981.20	4055.83	4131.32	35
36	3552.72	3622.35	3692.73	3763.87	3835.86	3908.73	3982.44	4057.08	4132.59	36
37	3553.87	3623.52	3693.91	3765.07	3837.07	3909.95	3983.68	4058.33	4133.86	37
38	3555.03	3624.69	3695.09	3766.27	3838.28	3911.17	3984.91	4059.58	4135.13	38
39	3556.18	3625.86	3696.27	3767.46	3839.49	3912.40	3986.15	4060.84	4136.40	39
40	3557.34	3627.03	3697.45	3768.66	3840.70	3913.62	3987.39	4062.09	4137.67	40
41	3558.49	3628.20	3698.63	3769.85	3841.91	3914.85	3988.63	4063.34	4138.94	41
42	3559.65	3629.37	3699.81	3771.05	3843.12	3916.07	3989.87	4064.60	4140.21	42
43	3560.80	3630.54	3700.99	3772.24	3844.33	3917.30	3991.10	4065.85	4141.48	43
44	3561.96	3631.71	3702.17	3773.44	3845.54	3918.52	3992.34	4067.10	4142.75	44
45	3563.12	3632.88	3703.35	3774.64	3846.75	3919.74	3993.58	4068.36	4144.02	45
46	3564.27	3634.04	3704.53	3775.83	3847.95	3920.97	3994.82	4069.61	4145.29	46
47	3565.43	3635.21	3705.72	3777.03	3849.16	3922.19	3996.06	4070.86	4146.56	47
48	3566.58	3636.38	3706.90	3778.22	3850.37	3923.42	3997.29	4072.11	4147.83	48
49	3567.74	3637.55	3708.08	3779.42	3851.58	3924.64	3998.52	4073.37	4149.10	49
50	3568.89	3638.72	3709.26	3780.61	3852.79	3925.87	3999.77	4074.62	4150.37	50
51	3570.05	3639.89	3710.44	3781.81	3854.00	3927.09	4001.01	4075.87	4151.64	51
52	3571.21	3641.06	3711.62	3783.01	3855.21	3928.31	4002.25	4077.13	4152.91	52
53	3572.36	3642.23	3712.80	3784.20	3856.42	3929.54	4003.48	4078.38	4154.18	53
54	3573.52	3643.40	3713.98	3785.40	3857.63	3930.76	4004.72	4079.63	4155.45	54
55	3574.67	3644.57	3715.16	3786.59	3858.84	3931.99	4005.96	4080.89	4156.72	55
56	3575.83	3645.73	3716.34	3787.79	3860.04	3933.21	4007.20	4082.14	4157.99	56
57	3576.99	3646.90	3717.52	3788.98	3861.25	3934.44	4008.44	4083.39	4159.26	57
58	3578.14	3648.07	3718.70	3790.18	3862.46	3935.66	4009.67	4084.64	4160.53	58
59	3579.30	3649.24	3719.88	3791.38	3863.67	3936.88	4010.91	4085.90	4161.80	59

RAILROAD CURVE TABLES.

′	72°	73°	74°	75°	76°	77°	78°	79°	80°	′
0	4163.07	4239.97	4317.84	4396.74	4476.73	4557.81	4640.04	4723.41	4808.04	0
1	4164.35	4241.26	4319.15	4398.07	4478.08	4559.18	4641.43	4724.82	4809.47	1
2	4165.63	4242.56	4320.46	4399.40	4479.42	4560.54	4642.81	4726.22	4810.89	2
3	4166.90	4243.85	4321·77	4400.73	4480.77	4561.91	4644.20	4727.63	4812.32	3
4	4168.18	4245.14	4323.08	4402.06	4482.12	4563.27	4645.58	4729.03	4813.74	4
5	4169.46	4246.44	4324.39	4403.39	4483.46	4564.64	4646.97	4730.44	4815.17	5
6	4170.74	4247.73	4325.70	4404.71	4484.81	4566.01	4648.35	4731.85	4816.59	6
7	4172.02	4249.02	4327.01	4406.04	4486.16	4567.37	4649.74	4733.25	4818.02	7
8	4173.29	4250.31	4328.32	4407.37	4487.51	4568.74	4651.12	4734.66	4819.44	8
9	4174.57	4251.61	4329.63	4408.70	4488.85	4570.10	4652.50	4736.06	4820.87	9
10	4175.85	4252.90	4330.94	4410.03	4490.20	4571.47	4653.89	4737.47	4822.29	10
11	4177.13	4254.19	4332.25	4411.36	4491.55	4572.83	4655.27	4738.87	4823.72	11
12	4178.41	4255.49	4333.56	4412.69	4492.89	4574.20	4656.66	4740.28	4825.14	12
13	4179.68	4256.78	4334.87	4414.02	4494.24	4575.56	4658.04	4741.68	4826.57	13
14	4180.96	4258.07	4336.18	4415.35	4495.59	4576.93	4659.43	4743.09	4827.99	14
15	4182.24	4259.36	4337.49	4416.68	4496.93	4578.30	4660.81	4744.50	4829.42	15
16	4183.52	4260.66	4338.80	4418.01	4498.28	4579.66	4662.20	4745.90	4830.84	16
17	4184.80	4261.95	4340.11	4419.34	4499.63	4581.03	4663.58	4747.31	4832.27	17
18	4186.07	4263.24	4341.42	4420.67	4500.98	4582.39	4664.97	4748.71	4833.69	18
19	4187.35	4264.54	4342.73	4422.00	4502.32	4583.76	4666.35	4750.12	4835.12	19
20	4188.63	4265.83	4344.05	4423.33	4503.67	4585.12	4667.73	4751.52	4836.54	20
21	4189.91	4267.12	4345.36	4424.65	4505.01	4586.49	4669.12	4752.93	4837.97	21
22	4191.19	4268.42	4346.67	4425.98	4506.35	4587.86	4670.50	4754.34	4839.39	22
23	4192.46	4269.71	4347.98	4427.31	4507.70	4589.22	4671.89	4755.74	4840.82	23
24	4193.74	4271.00	4349.29	4428.64	4509.05	4590.59	4673.27	4757.15	4842.24	24
25	4195.02	4272.29	4350.60	4429.97	4510.39	4591.95	4674.66	4758.55	4843.67	25
26	4196.30	4273.59	4351.91	4431.30	4511.74	4593.32	4676.04	4759.96	4845.09	26
27	4197.57	4274.88	4353.22	4432.63	4513.09	4594.69	4677.43	4761.37	4846.52	27
28	4198.85	4276.17	4354.53	4433.96	4514.44	4596.05	4678.81	4762.77	4847.94	28
29	4200.13	4277.47	4355.84	4435.29	4515.78	4597.42	4680.20	4764.18	4849.37	29
30	4201.41	4278.76	4357.15	4436.62	4517.13	4598.78	4681.58	4765.58	4850.79	30
31	4202.70	4280.06	4358.47	4437.96	4518.49	4600.15	4682.97	4766.99	4852.23	31
32	4203.98	4281.36	4359.79	4439.29	4519.84	4601.53	4684.37	4768.41	4853.66	32
33	4205.27	4282.67	4361.11	4440.63	4521.20	4602.91	4685.76	4769.83	4855.10	33
34	4206.55	4283.97	4362.43	4441.97	4522.55	4604.28	4687.16	4771.24	4856.53	34
35	4207.84	4285.27	4363.75	4443.30	4523.91	4605.66	4688.55	4772.66	4857.97	35
36	4209.12	4286.58	4365.07	4444.64	4525.27	4607.03	4689.94	4774.07	4859.41	36
37	4210.41	4287.88	4366.39	4445.98	4526.62	4608.41	4691.34	4775.49	4860.84	37
38	4211.69	4289.18	4367.71	4447.32	4527.98	4609.78	4692.73	4776.90	4862.28	38
39	4212.98	4290.48	4369.03	4448.65	4529.33	4611.16	4694.13	4778.32	4863.71	39
40	4214.26	4291.79	4370.35	4449.99	4530.69	4612.53	4695.52	4779.73	4865.15	40
41	4215.55	4293.09	4371.67	4451.33	4532.05	4613.91	4696.92	4781.15	4866.59	41
42	4216.83	4294.39	4372.99	4452.66	4533.40	4615.28	4698.31	4782.56	4868.03	42
43	4218.12	4295.69	4374.31	4454.00	4534.76	4616.66	4699.70	4783.98	4869.46	43
44	4219.40	4297.00	4375.63	4455.34	4536.11	4618.03	4701.10	4785.39	4870.90	44
45	4220.69	4298.30	4376.94	4456.67	4537.47	4619.41	4702.49	4786.81	4872.33	45
46	4221.98	4299.60	4378.26	4458.01	4538.83	4620.78	4703.89	4788.22	4873.77	46
47	4223.26	4300.91	4379.58	4459.35	4540.18	4622.16	4705.28	4789.64	4875.21	47
48	4224.55	4302.21	4380.90	4460.69	4541.54	4623.53	4706.67	4791.05	4876.64	48
49	4225.83	4303.51	4382.22	4462.02	4542.89	4624.91	4708.07	4792.47	4878.08	49
50	4227.12	4304.81	4383.54	4463.36	4544.25	4626.29	4709.47	4793.89	4879.52	50
51	4228.40	4306.12	4384.86	4464.70	4545.61	4627.66	4710.86	4795.30	4880.95	51
52	4229.69	4307.42	4386.18	4466.03	4546.96	4629.04	4712.25	4796.72	4882.39	52
53	4230.97	4308.72	4387.50	4467.37	4548.32	4630.41	4713.65	4798.13	4883.83	53
54	4232.26	4310.02	4388.82	4468.71	4549.67	4631.79	4715.04	4799.55	4885.26	54
55	4233.54	4311.33	4390.14	4470.04	4551.03	4633.16	4716.44	4800.96	4886.70	55
56	4234.83	4312.63	4391.46	4471.38	4552.39	4634.54	4717.83	4802.38	4888.13	56
57	4236.11	4313.93	4392.78	4472.72	4553.74	4635.91	4719.22	4803.79	4889.57	57
58	4237.40	4315.23	4394.10	4474.06	4555.10	4637.29	4720.62	4805.21	4891.00	58
59	4238.68	4316.54	4395.42	4475·39	4556.45	4638.66	4722.01	4806.62	4892.44	59

RAILROAD CURVE TABLES.

′	81°	82°	83°	84°	85°	86°	87°	88°	89°	′
0	4893.88	4980.97	5069.44	5159.29	5250.57	5343.28	5437.54	5533.35	5630.81	0
1	4895.33	4982.44	5070.93	5160.80	5252.11	5344.84	5439.13	5534.97	5632.46	1
2	4896.77	4983.91	5072.42	5162.32	5253.65	5346.41	5440.72	5536.59	5634.10	2
3	4898.22	4985.38	5073.92	5163.83	5255.19	5347.97	5442.31	5538.20	5635.75	3
4	4899.66	4986.85	5075.41	5165.35	5256.73	5349.54	5443.90	5539.82	5637.39	4
5	4901.11	4988.32	5076.90	5166.86	5258.27	5351.10	5445.50	5541.44	5639.04	5
6	4902.56	4989.78	5078.39	5168.38	5259.81	5352.67	5447.09	5543.06	5640.69	6
7	4904.00	4991.25	5079.88	5169.89	5261.35	5354.23	5448.68	5544.68	5642.33	7
8	4905.45	4992.72	5081.38	5171.41	5262.88	5355.79	5450.27	5546.29	5643.98	8
9	4906.89	4994.19	5082.87	5172.92	5264.42	5357.36	5451.86	5547.91	5645.63	9
10	4908.34	4995.66	5084.36	5174.44	5265.96	5358.92	5453.45	5549.53	5647.27	10
11	4909.78	4997.13	5085.85	5175.95	5267.50	5360.49	5455.04	5551.14	5648.92	11
12	4911.23	4998.60	5087.34	5177.47	5269.04	5362.05	5456.63	5552.76	5650.57	12
13	4912.68	5000.07	5088.84	5178.98	5270.58	5363.62	5458.22	5554.38	5652.21	13
14	4914.12	5001.54	5090.33	5180.50	5272.12	5365.18	5459.81	5556.00	5653.86	14
15	4915.57	5003.01	5091.82	5182.01	5273.66	5366.74	5461.41	5557.62	5655.50	15
16	4917.01	5004.47	5093.31	5183.53	5275.20	5368.31	5463.00	5559.24	5657.15	16
17	4918.46	5005.94	5094.80	5185.04	5276.74	5369.87	5464.59	5560.85	5658.80	17
18	4919.91	5007.41	5096.30	5186.56	5278.28	5371.44	5466.18	5562.47	5660.44	18
19	4921.35	5008.88	5097.79	5188.07	5279.82	5373.00	5467.77	5564.09	5662.09	19
20	4922.79	5010.35	5099.28	5189.58	5281.36	5374.57	5469.36	5565.70	5663.74	20
21	4924.24	5011.82	5100.77	5191.10	5282.90	5376.13	5470.95	5567.32	5665.38	21
22	4925.69	5013.29	5102.26	5192.61	5284.44	5377.69	5472.54	5568.94	5667.03	22
23	4927.13	5014.76	5103.76	5194.13	5285.97	5379.26	5474.13	5570.56	5668.67	23
24	4928.58	5016.23	5105.25	5195.64	5287.51	5380.82	5475.72	5572.18	5670.32	24
25	4930.02	5017.69	5106.74	5197.16	5289.05	5382.39	5477.32	5573.79	5671.97	25
26	4931.47	5019.16	5108.23	5198.67	5290.59	5383.95	5478.91	5575.41	5673.61	26
27	4932.92	5020.63	5109.72	5200.19	5292.13	5385.51	5480.50	5577.03	5675.26	27
28	4934.36	5022.10	5111.22	5201.70	5293.67	5387.08	5482.09	5578.65	5676.91	28
29	4935.81	5023.57	5112.71	5203.22	5295.21	5388.64	5483.68	5580.27	5678.55	29
30	4937.25	5025.04	5114.20	5204.73	5296.75	5390.21	5485.27	5581.88	5680.20	30
31	4938.71	5026.52	5115.70	5206.26	5298.30	5391.79	5486.87	5583.51	5681.86	31
32	4940.16	5028.00	5117.21	5207.79	5299.85	5393.37	5488.48	5585.14	5683.52	32
33	4941.62	5029.48	5118.71	5209.31	5301.40	5394.94	5490.08	5586.77	5685.18	33
34	4943.08	5030.96	5120.21	5210.84	5302.95	5396.52	5491.68	5588.40	5686.84	34
35	4944.54	5032.44	5121.72	5212.37	5304.51	5398.10	5493.29	5590.04	5688.50	35
36	4945.99	5033.92	5123.22	5213.90	5306.06	5399.68	5494.89	5591.67	5690.16	36
37	4947.45	5035.40	5124.72	5215.43	5307.61	5401.25	5496.49	5593.30	5691.82	37
38	4948.91	5036.88	5126.22	5216.95	5309.16	5402.83	5498.09	5594.93	5693.48	38
39	4950.36	5038.36	5127.73	5218.48	5310.71	5404.41	5499.70	5596.56	5695.14	39
40	4951.82	5039.84	5129.23	5220.01	5312.26	5405.99	5501.30	5598.19	5696.80	40
41	4953.28	5041.32	5130.73	5221.54	5313.81	5407.56	5502.90	5599.82	5698.46	41
42	4954.74	5042.80	5132.24	5223.07	5315.36	5409.14	5504.50	5601.45	5700.12	42
43	4956.19	5044.28	5133.74	5224.59	5316.91	5410.72	5506.11	5603.08	5701.78	43
44	4957.65	5045.76	5135.24	5226.12	5318.46	5412.30	5507.71	5604.71	5703.44	44
45	4959.11	5047.24	5136.75	5227.65	5320.02	5413.88	5509.31	5606.35	5705.10	45
46	4960.57	5048.72	5138.25	5229.18	5321.57	5415.45	5510.91	5607.98	5706.76	46
47	4962.02	5050.20	5139.75	5230.71	5323.12	5417.03	5512.52	5609.61	5708.42	47
48	4963.48	5051.68	5141.25	5232.23	5324.67	5418.61	5514.12	5611.24	5710.08	48
49	4964.94	5053.16	5142.76	5233.76	5326.22	5420.19	5515.72	5612.87	5711.74	49
50	4966.40	5054.64	5144.26	5235.29	5327.77	5421.76	5517.32	5614.50	5713.40	50
51	4967.85	5056.12	5145.76	5236.82	5329.32	5423.34	5518.93	5616.13	5715.06	51
52	4969.31	5057.60	5147.27	5238.35	5330.87	5424.92	5520.53	5617.76	5716.72	52
53	4970.77	5059.08	5148.77	5239.87	5332.42	5426.50	5522.13	5619.39	6718.38	53
54	4972.22	5060.56	5150.27	5241.40	5333.97	5428.07	5523.74	5621.02	5720.04	54
55	4973.68	5062.04	5151.77	5242.93	5335.53	5429.65	5525.34	5622.66	5721.70	55
56	4975.14	5063.52	5153.28	5244.46	5337.08	5431.23	5526.94	5624.29	5723.36	56
57	4976.60	5065.00	5154.78	5245.99	5338.63	5432.81	5528.54	5625.92	5725.02	57
58	4978.05	5066.48	5156.28	5247.51	5340.18	5434.39	5530.15	5627.55	5726.68	58
59	4979.51	5067.96	5157.79	5249.04	5341.73	5435.96	5531.75	5629.18	5728.34	59

TABLE OF MINUTES WITH CORRESPONDING DECIMALS.

M.	D.	M.	D.
′	°	′	°
1	0.0166	31	0.5167
2	0.0333	32	0.5333
3	0.0500	33	0.5500
4	0.0667	34	0.5667
5	0.0833	35	0.5833
6	0.1000	36	0.6000
7	0.1167	37	0.6167
8	0.1333	38	0.6333
9	0.1500	39	0.6500
10	0.1667	40	0.6667
11	0.1833	41	0.6833
12	0.2000	42	0.7000
13	0.2167	43	0.7167
14	0.2333	44	0.7333
15	0.2500	45	0.7500
16	0.2667	46	0.7667
17	0.2833	47	0.7833
18	0.3000	48	0.8000
19	0.3167	49	0.8167
20	0.3333	50	0.8333
21	0.3500	51	0.8500
22	0.3667	52	0.8667
23	0.3833	53	0.8833
24	0.4000	54	0.9000
25	0.4167	55	0.9167
26	0.4333	56	0.9333
27	0.4500	57	0.9500
28	0.4667	58	0.9667
29	0.4833	59	0.9833
30	0.5000	60	1.0000

TABLE OF SECONDS WITH CORRESPONDING DECIMALS.

S.	D.	S.	D.
″	°	″	°
1	0.0002778	31	0.0086111
2	0.0005556	32	0.0088888
3	0.0008333	33	0.0091666
4	0.0011111	34	0.0094444
5	0.0013888	35	0.0097222
6	0.0016666	36	0.0100000
7	0.0019444	37	0.0102777
8	0.0022222	38	0.0105555
9	0.0025000	39	0.0108333
10	0.0027777	40	0.0111111
11	0.0030555	41	0.0113888
12	0.0033333	42	0.0116666
13	0.0036111	43	0.0119444
14	0.0038888	44	0.0122222
15	0.0041666	45	0.0125000
16	0.0044444	46	0.0127777
17	0.0047722	47	0.0130555
18	0.0050000	48	0.0133333
19	0.0052777	49	0.0136111
20	0.0055555	50	0.0138888
21	0.0058333	51	0.0141666
22	0.0061111	52	0.0144444
23	0.0063888	53	0.0147222
24	0.0066666	54	0.0150000
25	0.0069444	55	0.0152777
26	0.0072222	56	0.0155555
27	0.0075000	57	0.0158333
28	0.0077777	58	0.0161111
29	0.0080555	59	0.0163888
30	0.0083333	60	0.0166666

RAILROAD CURVE TABLE.

The following Table shows the distance from the point of intersection of the Tangent lines to the beginning of one degree curves, for each 30′, the angle of deflection (= angle at centre) being known.

I. = The given angle of deflection.

II. = The sought for distance.

III. = Difference for intermediate angles.

RAILROAD CURVE TABLE.

I	II	III	I	II	III	I	II	III
0° 0′	25.00	25.0	30° 30′	1562.17	26.8	60° 30′	3341.62	33.4
1	50.02	25.0	31	1589.04	26.9	61	3375.20	33.6
1 30	75.01	25.0	31 30	1616.03	27.0	61 30	3408.95	33.8
2	99.99	25.0	32	1643.08	27.0	62	3442.93	34.0
2 30	125.03	25.0	32 30	1670.12	27.0	62 30	3477.02	34.1
3	150.07	25.0	33	1697.28	27.2	63	3511.34	34.3
3 30	175.05	25.0	33 30	1724.56	27.3	63 30	3545.78	34.4
4	200.09	25.0	34	1751.88	27.3	64	3580.45	34.7
4 30	225.13	25.0	34 30	1779.22	27.4	64 30	3615.34	34.9
5	250.17	25.0	35	1806.67	27.4	65	3650.41	35.1
5 30	275.21	25.0	35 30	1834.17	27.5	65 30	3685.65	35.2
6	300.30	25.0	36	1861.79	27.6	66	3721.06	35.4
6 30	325.35	25.0	36 30	1889.47	27.7	66 30	3756.70	35.6
7	350.44	25.1	37	1917.26	27.8	67	3792.57	35.9
7 30	375.54	25.1	37 30	1945.05	27.8	67 30	3828.61	36.0
8	400.70	25.1	38	1973.01	27.9	68	3864.88	36.3
8 30	425.79	25.1	38 30	2001.03	28.0	68 30	3901.38	36.5
9	450.95	25.1	39	2029.11	28.1	69	3938.11	36.7
9 30	476.10	25.1	39 30	2057.30	28.2	69 30	3975.01	36.9
10	501.32	25.2	40	2085.55	28.3	70	4012.15	37.1
10 30	526.53	25.2	40 30	2113.91	28.4	70 30	4049.56	37.4
11	551.74	25.2	41	2142.33	28.4	71	4087.15	37.6
11 30	576.95	25.2	41 30	2170.92	28.6	71 30	4124.97	37.8
12	602.22	25.3	42	2199.52	28.6	72	4163.07	38.1
12 30	627.55	25.3	42 30	2228.28	28.8	72 30	4201.41	38.3
13	652.87	25.3	43	2257.10	28.8	73	4239.97	38.6
13 30	678.20	25.3	43 30	2286.04	28.9	73 30	4278.76	38.8
14	703.53	25.3	44	2315.09	29.0	74	4317.84	38.9
14 30	728.97	25.4	44 30	2344.20	29.1	74 30	4357.15	39.3
15	754.35	25.4	45	2373.42	29.2	75	4396.74	39.6
15 30	779.79	25.4	45 30	2402.76	29.3	75 30	4436.62	39.9
16	805.29	25.5	46	2432.21	29.4	76	4476.73	40.1
16 30	830.79	25.5	46 30	2461.78	29.6	76 30	4517.13	40.4
17	856.35	25.5	47	2491.46	29.7	77	4557.81	40.7
17 30	881.90	25.5	47 30	2521.26	29.8	77 30	4598.78	41.0
18	907.52	25.6	48	2551.11	29.8	78	4640.04	41.3
18 30	933.18	25.6	48 30	2581.13	30.0	78 30	4681.58	41.5
19	958.86	25.7	49	2611.27	30.1	79	4723.41	41.8
19 30	984.58	25.7	49 30	2641.58	30.3	79 30	4765.58	42.2
20	1010.37	25.8	50	2671.90	30.4	80	4808.04	42.5
20 30	1036.15	25.8	50 30	2702.44	30.5	80 30	4850.79	42.7
21	1062.00	25.8	51	2733.04	30.6	81	4893.88	43.1
21 30	1089.90	25.9	51 30	2763.81	30.8	81 30	4937.25	43.3
22	1113.80	25.9	52	2794.69	30.9	82	4980.97	43.7
22 30	1139.75	25.9	52 30	2825.69	31.0	82 30	5025.04	44.1
23	1165.76	26.0	53	2856.86	31.2	83	5069.44	44.4
23 30	1191.84	26.1	53 30	2888.15	31.3	83 30	5114.20	44.8
24	1217.96	26.1	54	2919.55	31.4	84	5159.29	45.1
24 30	1244.10	26.1	54 30	2951.12	31.6	84 30	5204.73	45.4
25	1270.28	26.2	55	2982.81	31.7	85	5250.57	45.8
25 30	1296.58	26.3	55 30	3014.67	31.9	85 30	5296.75	46.2
26	1322.88	26.3	56	3046.64	32.0	86	5343.28	46.5
26 30	1349.24	26.4	56 30	3078.79	32.2	86 30	5390.21	46.9
27	1375.65	26.4	57	3111.10	32.3	87	5437.54	47.3
27 30	1402.10	26.4	57 30	3143.53	32.4	87 30	5485.27	47.7
28	1428.65	26.5	58	3176.14	32.6	88	5533.35	48.1
28 30	1455.25	26.6	58 30	3208.91	32.8	88 30	5581.88	48.5
29	1481.89	26.6	59	3241.86	32.9	89	5630.81	48.9
29 30	1508.59	26.7	59 30	3274.92	33.1	89 30	5680.20	49.4
30	1535.30	26.7	60	3308.21	33.3	90	5730.00	49.8

RAILROAD CURVES.

THE FOLLOWING TABLE

SHOWS THE METHOD

OF KEEPING THE FIELD NOTES

OF A SURVEY, FROM WHICH THE

CENTRE LINE IS LAID ON THE MAP.

From station.	To station.	Length of tangents in feet.	Length of curves in feet.	Angle at intersection of tangents or angle at centre.	Course of tangent, and degree and direction of curves.	Radius of curves in feet.	Number of feet from intersection of tangents to beginning of curve.
....	....	....	....	Tangent	S. 19° 21' E.		
0.	2.		200	7° 24'	3° 42' L.	1548.65	100.14
2.	26		2400.	24° 00'	1° 00' R.	5730.	1217 96
26.	43 556	1755 60		Tangent	S. 2° 45' E.		
43.556	61 681		1812.5	36° 15'	2° 00' R	2865.	937.82
61 681	93 650	3196 90		Tangent	S. 33° 30' W.		
93 650	102 517		886.7	13° 18'	1° 30' L.	3820	445.37
102 517	143 90	4138.30		Tangent	S. 20° 12' W.		
143 90	155 766		1186.66	23° 44'	2° 00' L.	2865.	602.02
155 766	170 43	1466.40		Tangent	S. 3° 32' E.		
170 43	181.296		1086.66	21° 44'	2° 00' R.	2865.	550 00
181.296	184 506	321.00		Tangent	S. 18° 12' W.		
184 506	193.195		868.89	13° 02'	1° 30' R.	3820.	436.37
193 195	213 064	1986.9		Tangent	S. 31° 14' W.		
213 064	220 908		784 44	11° 46'	1° 30' L.	3820.	393.61
220.908	230 546	963.8		Tangent	S. 19° 28' W.		
230 546	242.496		1195.00	23° 54'	2° 00' R.	2865.	606 37
242 496	252 356	986.00		Tangent	S. 43° 22' W.		
252 356	263 756		1140.00	17° 06'	1° 30' L.	3820.	574.30
263.756	2 6 02	226.40		Tangent	S. 26° 16' W.		
266.02	268.02		200 00	3°	1° 30' L.	3820.	100.05
268.02	277.21		918.89	27° 34'	3° L.	1910.	468.55
277.21	279.21		200.00	3° 00'	1° 30' L.	3820.	100.05
279 21	289 011	980.1		Tangent	S. 7° 18' E.		
289.011	291 011		200 00	3° 00'	1° 30' R.	3820	100.05
291.011	301 422		1041.10	31° 14'	3° 00' R.	19.0.	533.88
301 422	303.00		157.80	2° 22'	1° 30' R.	3820.	78.90
303 00	321 00	1800.		Tangent	S. 29° 18' W.		
321 00	334 00		1300.	26°	2° L.	2865.	661.44
334	338 71	471.00		Tangent	S. 3° 18' W.		
338.71	347.15		844-16	16° 53'	2° 00' R.	2865.	425.19
347.15	364 00	1685.00		Tangent	S. 20° 11' W.		
364	376 638		1263.33	37° 54'	3° R.	1910.	655.80
376 633	389 53	389 70		Tangent	S. 58° 05' W.		
380 53	392.38		1185.	23° 42'	2° R.	2865.	60'.14
392 38	402 92	1054.00		Tangent	S. 81° 47' W.		
402.92	404.92		200	3° 00'	1° 30' L	3820.	100.03
404 92	418.198		1327 77	39° 50'	3° 00' L.	1910.	632.04
418 198	420.198	200.		Tangent	S. 38° 57' W.		
420.198	441.002		2080.41	83° 18'	4° L.	1432.	1272.21
441.002	442.582		158.	4° 00'	2° 32' L.	2261.87	79.99
442.582	449.	641 8		Tangent	S. 4[illegible]° 16' E.		
		22.262 90	22 637.31				

APPLICATION OF THE PRISMOIDAL FORMULA

in determining the quantities of Railroad and Canal Excavations and Embankments.

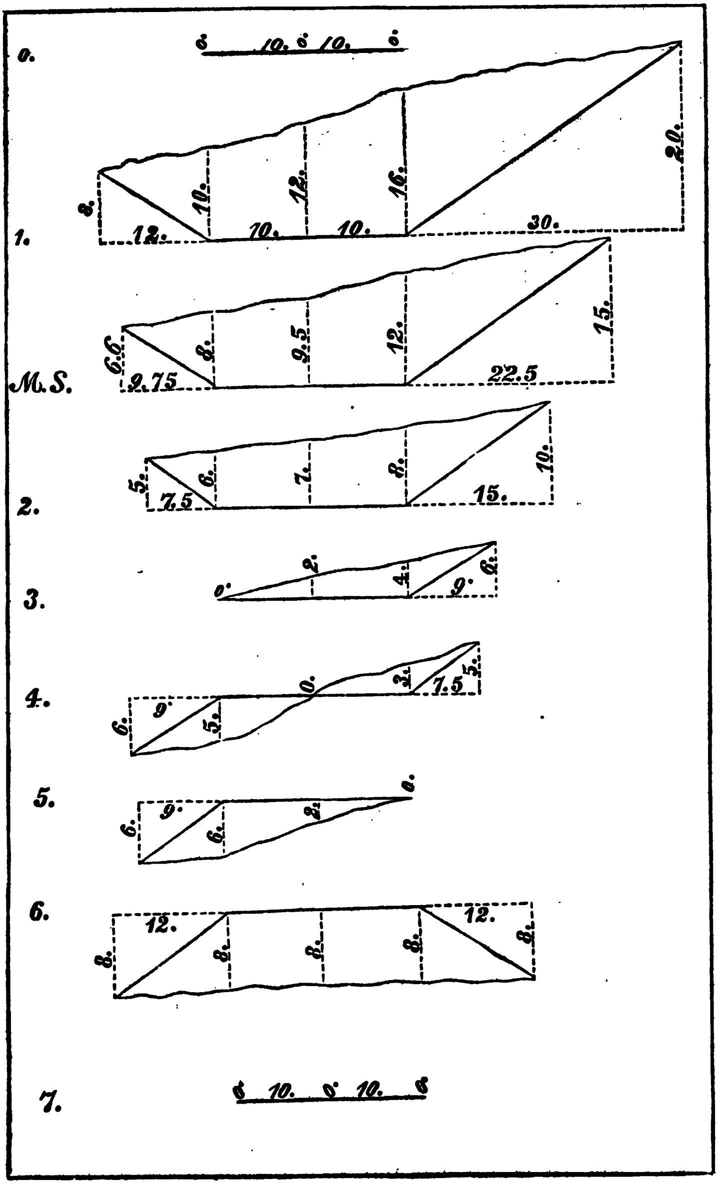
In order to obtain the mean area from transverse sections, construct from the average cuttings and average horizontal distances of the slopes of the end sections, a middle section; and add to four times the area of this section the area of the end sections, and take one-sixth of the product for the mean area.

The following diagrams show most of the figures which occur in taking cross sections of railroads, and serve to illustrate the application of the formula. In practice, however, intermediate sections would be taken between sta. 0. and sta. 1, and at such other points as any sudden or material change in the surface would seem to require.

The cuttings and horizontal distances from the centre to the termination of the slopes, are set down in tabular form, (*page* 34.) The notes of the middle section may at convenience be interlined in the space between the notes of the end sections. From this form the factors for the areas are made without resorting to diagrams.

* It will be seen by inspecting the diagrams that the embankment between stations 3 and 4 assumes the shape of a pyramid, and hence one-third of the area of the embankment set opposite station 4, should be multiplied by the distance between stations 3 and 4 to obtain the quantity. Between stations 4 and 5 the excavation assumes the same form, and should also be calculated as a pyramid; or construct the middle section as before described, and calculate the distance from the centre to the point where the surface and the grade intersect; and make out the factors accordingly,

Having obtained the mean areas, proceed as hereinafter described to ascertain the cubic yards.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0. 10. 0. 10. 0.

FIELD NOTES FOR TRANSVERSE SECTIONS.

Stations.	Distances in feet.	Left slope stake +or–	Dist. from centr.	Angl. +or–	C'ntr. +or–	A'gle +or–	Dist. from centr.	Right slope stake +or–	Area of Excav.	Area of Embank't.	Mean area of Excav.	Mean area of Emb'k.	Cubic y'ds of Excav.	Cubic yards of Embank't.
0	0	0	10.	0	0	0	10.	0	0					
M. S.		+4.	16.	+5.	+6.	+8.	25.	+10.	200.					
1	100	+8.	22.	+10.	+12.	+16.	40.	+20.	550.		225.		833.33	
M. S.		+6.5	19.75	+8.	+9.5	+12.	32.5	+15.	369.					
2	100	+5.	17.5	+6.	+7.	+8.	25.	+10.	222.5		374.75		1387.96	
M. S.		+2.5	13.75	+3.	+4.5	+6.	22.	+8.	131.62					
3	100	0	10.	0	+2.	+4.	19.	+6.	58.		134.5		498.14	
M. S.		—3.	14 5	—2.5	+1	+3.5	18.25	+5.5	38.34		*			
4	100	—6.	19.	—5.	—0	+3.	17.5	+5.	26.25	47.5	39.60	15.83	146.66	58.62
M. S.		—6.	19.	—5.5	—1.	+1.5	13.75	+2.5		59.8				
5	100	—6.	19.	—6.	—2.	0	10.	0.		77.	8.75	60.61	32.40	224.48
M. S.		—7.	20 5	—7.	—5.	—4.	16.	—4.		153.75				
6	100	—8.	22.	—8,	—8.	—8.	22.	—8.		256.		158.0		585.18
M. S.		—4.	16.	—4.	—4.	—4.	16	—4.		104.				
7	100	0	10.	0	0	0	10.	0		0		112.0		414.81

FACTORS.

EXCAVATION.

Station 0. *Areas.*

0. —— 0. —— 0. = 000.

Middle Section.

16. × 5. = 80.

20. × 6. = 120.

25. × 8. = 200.

400.+2.= 200.

Station 1.

22. × 10. = 220

20. × 12. = 240.

40. × 16. = 640.

1100.+2.=550.

Middle Section.

19.75× 8. = 158.

9.50× 20. = 190.

32.50× 12. = 390.

738.+2.=369.

Station 2.

17.50× 6. = 105.

20. × 7. = 140.

25. × 8. = 200.

445.+2.=222.5.

Middle Section.

13.75× 3. = 41.25

20. × 4.5= 90.

22. × 6. = 132.

263.25.+2.=131.62.

Station 3.

20. × 2. = 40.

19. × 4. = 76.

116.+2.=58.

Middle Section.

12.8 × 1 =12.80

18.25× 3.5=63.88

76.68+2.=38.34.

Station 4.

17.5 × 3. =52.5 +2.=26.25.

Station 5.

—— 0.

EMBANKMENT.

Station 4. *Areas:*

19. × 5. = 95.+2.=47.5

Middle Section.

19. × 5.5=104.5

15. × 1. = 15.

119.5+2.=59.75.

Station 5.

19. × 6. =114.

20. × 2. = 40.

154.+2.=77.

Middle Section.

20.5 × 7. =143.5

20. × 5. =100.

16. × 4. = 64.

307.5+2.=153.75

Station 6.

22. × 8. = 176.

20. × 8. = 160.

22. × 8. = 176.

512.+2.=256.

Middle Section.

16. × 4. = 64.

20. × 4. = 80.

16. × 4. = 64.

208.+2.=104.

Station 7.

0. —— 0. —— 0.

			C. yds.
The cubic yards between station 0. and station 1. according to the method of adding the end areas and taking one-half for the mean area - - -	= 1018.51	c. yds.	185.18
By 2d (or Prismoidal method)=	833.33	"	
" 1st method between station 1 & 2=	1430.55	"	42.59
" 2d " " " 1 & 2	1387.96	"	
" 1st " " " 2 & 3	519.44	"	21.30
" 2d " " " 2 & 3	498.14	"	
" 1st " " " 3 & 4	156.01	"	9.35
" 2d " " " 3 & 4	146.66	"	
" 1st " " " 4 & 5	48.59	"	16.19
" 2d " " " 4 & 5	32.40	"	
Error on 500 lineal feet of excavation - -			=274.61

There are other methods which approximate nearer than the averaging method. For instance, taking $\frac{11}{24}$ths of the difference between the end areas, (or the difference × by 0.46) and adding it to the lesser end area for the mean.

This method approximates nearer the true quantity. The principal discrepancy occurs where the embankment assumes the wedge or pyramidal form—

		cubic yards.
By 3d method between station 0 & 1	937.03	+ 103.70
" 2d " (or Prismoidal)- 0 & 1	833.33	
" 3d " between station 1 & 2	1382.03	— 5.93
" 2d " " " 1 & 2	1387.96	
" 3d " " " 2 & 3	495.08	— 3.06
" 2d " " " 2 & 3	498.14	
" 3d " " " 3 & 4	151.31	— 4.65
" 2d " " " 3 & 4	146.66	
" 3d " " " 4 & 5	44.72	+ 12.32
" 2d " " " 4 & 5	32.40	
Error on 500 lineal feet of excavation -		102.38

Another method is to multiply $\frac{1}{6}$ of the distance between transverse sections, by the sum of the end areas, added to four times half their sum; and dividing by 27 for the cubic yards.

The results are the same as by the first method except between stations 0 & 1.

Explanation of the following tables.

The tables are calculated for a distance of 100 feet between transverse sections.

In the left hand column are given the areas in feet. To obtain the cubic yards for areas, without decimals, look in the second column under the head of 0, and opposite the given area, find the cubic yards.

Example.—Required the number of cubic yards for an area of 190 feet. In the second column under the head of 0, and opposite 190 in the first column, find 703.70 cubic yards.

To obtain the cubic yards for a less distance than 100 feet, multiply the cubic yards found in the tables by the given distance, and point off the fractional parts of 100, feet.

If the area has decimal parts, pass the eye to the right, opposite the area of the whole number, and under the head of such decimal will be found the number of yards.

Example.—Required the cubic yards for an area of 105.4 feet. In the sixth column, under the head of 40, and opposite 105 in the first column, are given 390.37 cubic yards.

If the yards for an area greater than 354.90, and not exceeding 3549. feet, are required, the decimal point of the area given in the tables, and that of the cubic yards, being removed one figure to the right, will give the required yards. If there are decimal parts, add the cubic yards found opposite 0. in the first column, under the head of such decimal.

Example.—Required the cubic yards for an area of 1975 feet; remove the decimal point one figure to the left, and find the yards for an area of 197.5 feet = 731.48, then remove the decimal point one figure to the right and you have 7314.8 cubic yards. If there is a decimal, add the cubic yards found for such decimal.

Or, To obtain the cubic yards for an area exceeding 3549 feet, take one half of the area, and seek the corresponding yards in tables and multiply the same by 2.

EXCAVATION AND EMBANKMENT TABLES.

	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
0	0.00	0.37	0.74	1.11	1.48	1.85	2.22	2.59	2.96	3.33
1	3.70	4.07	4.45	4.81	5.19	5.56	5.93	6.30	6.67	7.04
2	7.41	7.78	8.15	8.52	8.89	9.26	9.63	10.00	10.37	10.74
3	11.11	11.48	11.85	12.22	12.59	12.96	13.33	13.70	14.07	14.44
4	14.82	15.19	15.56	15.93	16.30	16.67	17.04	17.41	17.78	18.15
5	18.52	18.89	19.26	19.63	20.00	20.37	20.74	21.11	21.48	21.85
6	22.22	22.59	22.96	23.33	23.70	24.07	24.44	24.82	25.19	25.56
7	25.93	26.30	26.67	27.04	27.41	27.78	28.15	28.52	28.89	29.26
8	29.63	30.00	30.37	30.74	31.11	31.48	31.85	32.22	32.59	32.96
9	33.33	33.70	34.07	34.44	34.82	35.19	35.56	35.93	36.30	36.67
10	37.04	37.41	37.78	38.15	38.52	38.89	39.26	39.63	40.00	40.37
11	40.74	41.11	41.48	41.85	42.22	42.59	42.96	43.33	43.70	44.07
12	44.44	44.82	45.19	45.56	45.93	46.30	46.67	47.04	47.41	47.78
13	48.15	48.52	48.89	49.26	49.63	50.00	50.37	50.74	51.11	51.48
14	51.85	52.22	52.59	52.96	53.33	53.70	54.07	54.44	54.82	55.19
15	55.56	55.93	56.30	56.67	57.04	57.41	57.78	58.15	58.52	58.89
16	59.26	59.63	60.00	60.37	60.74	61.11	61.48	61.85	62.22	62.59
17	62.96	63.33	63.70	64.07	64.44	64.82	65.19	65.56	65.93	66.30
18	66.67	67.04	67.41	67.78	68.15	68.52	68.89	69.26	69.63	70.00
19	70.37	70.74	71.11	71.48	71.85	72.22	72.59	72.96	73.33	73.70
20	74.07	74.44	74.82	75.19	75.56	75.93	76.30	76.67	77.04	77.41
21	77.78	78.15	78.52	78.89	79.26	79.63	80.00	80.37	80.74	81.11
22	81.48	81.85	82.22	82.59	82.96	83.33	83.70	84.07	84.44	84.82
23	85.19	85.56	85.93	86.30	86.67	87.04	87.41	87.78	88.15	88.52
24	88.89	89.26	89.63	90.00	90.37	90.74	91.11	91.48	91.85	92.22
25	92.59	92.96	93.33	93.70	94.07	94.44	94.82	95.19	95.56	95.93
26	96.30	96.67	97.04	97.41	97.78	98.15	98.52	98.89	99.26	99.63
27	100.00	100.37	100.74	101.11	101.48	101.85	102.22	102.59	102.96	103.33
28	103.70	104.07	104.44	104.82	105.19	105.56	105.93	106.30	106.67	107.04
29	107.41	107.78	108.15	108.52	108.89	109.26	109.63	110.00	110.37	110.74
30	111.11	111.48	111.85	112.22	112.59	112.96	113.33	113.70	114.07	114.44
31	114.81	115.18	115.56	115.92	116.29	116.67	117.03	117.40	117.77	118.15
32	118.52	118.89	119.26	119.63	120.00	120.37	120.74	121.11	121.48	121.85
33	122.22	122.59	122.96	123.33	123.70	124.07	124.44	124.81	125.18	125.55
34	125.92	126.30	126.66	127.03	127.40	127.77	128.14	128.51	128.88	129.26
35	129.63	130.00	130.37	130.74	131.11	131.48	131.85	132.22	132.59	132.96
36	133.33	133.70	134.07	134.44	134.81	135.18	135.55	135.92	136.29	136.67
37	137.04	137.41	137.78	138.15	138.52	138.89	139.26	139.63	140.00	140.37
38	140.74	141.11	141.48	141.85	142.22	142.59	142.96	143.33	143.70	144.07
39	144.44	144.81	145.18	145.55	145.92	146.29	146.66	147.03	147.40	147.78
40	148.15	148.52	148.89	149.26	149.63	150.00	150.37	150.74	151.11	151.48
41	151.85	152.22	152.59	152.96	153.33	153.70	154.07	154.44	154.81	155.18
42	155.55	155.92	156.29	156.66	157.03	157.40	157.77	158.14	158.51	158.89
43	159.26	159.63	160.00	160.37	160.74	161.11	161.48	161.85	162.22	162.59
44	162.96	163.33	163.70	164.07	164.44	164.81	165.18	165.55	165.92	166.30
45	166.67	167.04	167.41	167.78	168.15	168.52	168.89	169.26	169.63	170.00
46	170.37	170.74	171.11	171.48	171.85	172.22	172.59	172.96	173.33	173.70
47	174.07	174.44	174.81	175.18	175.55	175.92	176.29	176.66	177.03	177.41
48	177.78	178.15	178.52	178.89	179.26	179.63	180.00	180.37	180.74	181.11
49	181.48	181.85	182.22	182.59	182.96	183.33	183.70	184.07	184.44	184.81
50	185.18	185.55	185.92	186.29	186.66	187.03	187.40	187.77	188.14	188.52
51	188.89	189.26	189.63	190.00	190.37	190.74	191.11	191.48	191.85	192.22
52	192.59	192.96	193.33	193.70	194.07	194.44	194.81	195.18	195.55	195.93
53	196.30	196.67	197.04	197.41	197.78	198.15	198.52	198.89	199.26	199.63
54	200.00	200.37	200.74	201.11	201.48	201.85	202.22	202.59	202.96	203.33
55	203.70	204.07	204.44	204.81	205.18	205.55	205.92	206.29	206.66	207.03
56	207.41	207.78	208.15	208.52	208.89	209.26	209.63	210.00	210.37	210.74
57	211.11	211.48	211.85	212.22	212.59	212.96	213.33	213.70	214.07	214.44
58	214.81	215.18	215.55	215.92	216.29	216.66	217.03	217.40	217.77	218.15
59	218.52	218.89	219.26	219.63	220.00	220.37	220.74	221.11	221.48	221.85

EXCAVATION AND EMBANKMENT TABLES.

	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
60	222.22	222.59	222.96	223.33	223.70	224.07	224.44	224.81	225.18	225.55
61	225.92	226.29	226.66	227.03	227.40	227.77	228.14	228.51	228.88	229.26
62	229.63	230.00	230.37	230.74	231.11	231.48	231.85	232.22	232.59	232.96
63	233.33	233.70	234.07	234.44	234.81	235.18	235.55	235.92	236.29	236.67
64	237.04	237.41	237.78	238.15	238.52	238.89	239.26	239.63	240.00	240.37
65	240.74	241.11	241.48	241.85	242.22	242.59	242.96	243.33	243.70	244.07
66	244.44	244.81	245.18	245.55	245.92	246.30	246.67	247.04	247.41	247.78
67	248.15	248.52	248.89	249.26	249.63	250.00	250.37	250.74	251.11	251.48
68	251.85	252.22	252.59	252.96	253.33	253.70	254.07	254.44	254.81	255.18
69	255.56	255.93	256.30	256.67	257.04	257.41	257.78	258.15	258.52	258.89
70	259.26	259.63	260.00	260.37	260.74	261.11	261.48	261.85	262.22	262.59
71	262.96	263.33	263.70	264.07	264.44	264.81	265.18	265.55	265.92	266.30
72	266.67	267.04	267.41	267.78	268.15	268.52	268.89	269.26	269.63	270.00
73	270.37	270.74	271.11	271.48	271.85	272.22	272.59	272.96	273.33	273.70
74	274.07	274.44	274.81	275.18	275.55	275.92	276.29	276.66	277.04	277.41
75	277.78	278.15	278.52	278.89	279.26	279.63	280.00	280.37	280.74	281.11
76	281.48	281.85	282.22	282.59	282.96	283.33	283.70	284.07	284.44	284.81
77	285.18	285.56	285.93	286.30	286.67	287.04	287.41	287.78	288.15	288.52
78	288.89	289.26	289.63	290.00	290.37	290.74	291.11	291.48	291.85	292.22
79	292.59	292.96	293.33	293.70	294.07	294.44	294.81	295.18	295.55	295.93
80	296.30	296.67	297.04	297.41	297.78	298.15	298.52	298.89	299.26	299.63
81	300.00	300.37	300.74	301.11	301.48	301.85	302.22	302.59	302.96	303.33
82	303.70	304.07	304.44	304.81	305.18	305.55	305.92	306.29	306.66	307.03
83	307.41	307.78	308.15	308.52	308.89	309.26	309.63	310.00	310.37	310.74
84	311.11	311.48	311.85	312.22	312.59	312.96	313.33	313.70	314.07	314.44
85	314.81	315.19	315.56	315.93	316.30	316.67	317.04	317.41	317.78	318.15
86	318.52	318.89	319.26	319.63	320.00	320.37	320.74	321.11	321.48	321.85
87	322.22	322.59	322.96	323.33	323.70	324.07	324.44	324.81	325.18	325.55
88	325.92	326.30	326.67	327.04	327.41	327.78	328.15	328.52	328.89	329.26
89	329.63	330.00	330.37	330.74	331.11	331.48	331.85	332.22	332.59	332.96
90	333.33	333.70	334.07	334.44	334.81	335.18	335.55	335.92	336.29	336.67
91	337.04	337.41	337.78	338.15	338.52	338.89	339.25	339.62	339.99	340.37
92	340.74	341.11	341.48	341.85	342.22	342.59	342.96	343.33	343.70	344.07
93	344.44	344.81	345.18	345.56	345.93	346.30	346.67	347.03	347.40	347.78
94	348.15	348.52	348.89	349.26	349.63	350.00	350.37	350.74	351.11	351.48
95	351.85	352.22	352.59	352.96	353.33	353.70	354.07	354.44	354.81	355.18
96	355.55	355.93	356.30	356.67	357.04	357.41	357.78	358.15	358.52	358.89
97	359.26	359.63	360.00	360.37	360.74	361.11	361.48	361.85	362.22	362.59
98	362.96	363.33	363.70	364.07	364.44	364.81	365.18	365.55	365.93	366.30
99	366.67	367.04	367.41	367.78	368.15	368.52	368.89	369.26	369.63	370.00
100	370.37	370.74	371.11	371.48	371.85	372.22	372.59	372.96	373.33	373.70
101	374.07	374.44	374.81	375.18	375.55	375.92	376.29	376.67	377.04	377.41
102	377.78	378.15	378.52	378.89	379.26	379.63	380.00	380.37	380.74	381.11
103	381.48	381.85	382.22	382.59	382.96	383.33	383.70	384.07	384.44	384.81
104	385.18	385.55	385.92	386.29	386.67	387.04	387.41	387.78	388.15	388.52
105	388.89	389.26	389.63	390.00	390.37	390.74	391.11	391.48	391.85	392.22
106	392.59	392.96	393.33	393.70	394·07	394.44	394.81	395.18	395.55	395.92
107	396.30	396.67	397.04	397.41	397.78	398.15	398.52	398.89	399.26	399.63
108	400.00	400.37	400.74	401.11	401.48	401.85	402.22	402.59	402.96	403.33
109	403.70	404.07	404.44	404.81	405.18	405.55	405.92	406.29	406.67	407.04
110	407.41	407.78	408.15	408.52	408.89	409.26	409.63	410.00	410.37	410.74
111	411.11	411.48	411.85	412.22	412.59	412.96	413.33	413.70	414.07	414.44
112	414.81	415.18	415.55	415.92	416.29	416.67	417.04	417.41	417.78	418.15
113	418.52	418.89	419.26	419.63	420.00	420.37	420.74	421.11	421.48	421.85
114	422.22	422.59	422.96	423.33	423.70	424.07	424.44	424.81	425.18	425.56
115	425.93	426.30	426.67	427.04	427.41	427.78	428.15	428.52	428.89	429.26
116	429.63	430.00	430.37	430.74	431.11	431.48	431.85	432.22	432.59	432.96
117	433.33	433.70	434.07	434.44	434.81	435.18	435.55	435.92	436.29	436.67
118	437.04	437.41	437.78	438.15	438.52	438.89	439.26	439.63	440.00	440.37
119	440.74	441.11	441.48	441.85	442.22	442.59	442.96	443.33	443.70	444.07

EXCAVATION AND EMBANKMENT TABLES

	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
120	444.44	444.81	445.18	445.55	445.92	446.29	446.67	447.04	447.41	447.78
121	448.15	448.52	448.89	449.26	449.63	450.00	450.37	450.74	451.11	451.48
122	451.85	452.22	452.59	452.96	453.33	453.70	454.07	454.44	454.81	455.18
123	455.55	455.92	456.29	456.67	457.04	457.41	457.78	458.15	458.52	458.89
124	459.26	459.63	460.00	460.37	460.74	461.11	461.48	461.85	462.22	462.59
125	462.96	463.33	463.70	464.07	464.44	464.81	465.18	465.55	465.93	466.30
126	466.67	467.04	467.41	467.78	468.15	468.52	468.89	469.26	469.63	470.00
127	470.37	470.74	471.11	471.48	471.85	472.22	472.59	472.96	473.33	473.70
128	474.07	474.44	474.81	475.18	475.56	475.93	476.30	476.67	477.04	477.41
129	477.78	478.15	478.52	478.89	479.26	479.63	480.00	480.37	480.74	481.11
130	481.48	481.85	482.22	482.59	482.96	483.33	483.70	484.07	484.44	484.81
131	485.18	485.55	485.92	486.29	486.67	487.04	487.41	487.78	488.15	488.52
132	488.89	489.26	489.63	490.00	490.37	490.74	491.11	491.48	491.85	492.22
133	492.59	492.96	493.33	493.70	494.07	494.44	494.81	495.19	495.56	495.93
134	496.30	496.67	497.04	497.41	497.78	498.15	498.52	498.89	499.26	499.63
135	500.00	500.37	500.74	501.11	501.48	501.85	502.22	502.59	502.96	503.33
136	503.70	504.07	504.44	504.81	505.18	505.56	505.93	506.30	506.67	507.04
137	507.41	507.78	508.15	508.52	508.89	509.26	509.63	510.00	510.37	510.74
138	511.11	511.48	511.85	512.22	512.59	512.96	513.33	513.70	514.07	514.44
139	514.81	515.18	515.55	515.92	516.29	516.67	517.04	517.41	517.78	518.15
140	518.52	518.89	519.26	519.63	520.00	520.37	520.74	521.11	521.48	521.85
141	522.22	522.59	522.96	523.33	523.70	524.07	524.44	524.81	525.19	525.56
142	525.93	526.30	526.67	527.04	527.41	527.78	528.15	528.52	528.89	529.26
143	529.63	530.00	530.37	530.74	531.11	531.48	531.85	532.22	532.59	532.94
144	533.33	533.70	534.07	534.44	534.81	535.18	535.56	535.93	536.30	536.67
145	537.04	537.41	537.78	538.15	538.52	538.89	539.26	539.63	540.00	540.37
146	540.74	541.11	541.48	541.85	542.22	542.59	542.96	543.33	543.70	544.07
147	544.44	544.81	545.18	545.56	545.93	546.30	546.67	547.04	547.41	547.78
148	548.15	548.52	548.89	549.26	549.63	550.00	550.37	550.74	551.11	551.48
149	551.85	552.22	552.59	552.96	553.33	553.70	554.07	554.44	554.81	555.18
150	555.55	555.93	556.30	556.67	557.04	557.41	557.78	558.15	558.52	558.89
151	559.26	559.63	560.00	560.37	560.74	561.11	561.48	561.85	562.22	562.59
152	562.96	563.33	563.70	564.07	564.44	564.81	565.18	565.56	565.93	566.30
153	566.67	567.04	567.41	567.78	568.15	568.52	568.89	569.26	569.63	570.00
154	570.37	570.74	571.11	571.48	571.85	572.22	572.59	572.96	573.33	573.70
155	574.07	574.44	574.81	575.18	575.56	575.93	576.30	576.67	577.04	577.41
156	577.78	578.15	578.52	578.89	579.26	579.63	580.00	580.37	580.74	581.11
157	581.48	581.85	582.22	582.59	582.96	583.33	583.70	584.07	584.44	584.81
158	585.18	585.55	585.92	586.29	586.66	587.04	587.41	587.78	588.15	588.52
159	588.89	589.26	589.63	590.00	590.37	590.74	591.11	591.48	591.85	592.22
160	592.59	592.96	593.33	593.70	594.07	594.44	594.81	595.18	595.55	595.92
161	596.29	596.67	597.04	597.41	597.78	598.15	598.52	598.89	599.26	599.63
162	600.00	600.37	600.74	611.11	601.48	601.85	602.22	602.59	602.96	603.33
163	603.70	604.07	604.44	604.81	605.18	605.55	605.92	606.30	606.67	607.04
164	607.41	607.78	608.15	608.52	608.89	609.26	609.63	610.00	610.37	610.74
165	611.11	611.48	611.85	612.22	612.59	612.96	613.33	613.70	614.07	614.44
166	614.81	615.18	615.55	615.92	616.29	616.67	617.04	617.41	617.78	618.15
167	618.52	618.89	619.26	619.63	620.00	620.37	620.74	621.11	621.48	621.85
168	622.22	622.59	622.96	623.33	623.70	624.07	624.44	624.81	625.18	625.56
169	625.93	626.30	626.67	627.04	627.41	627.78	628.15	628.52	628.89	629.26
170	629.63	630.00	630.37	630.74	631.11	631.48	631.85	632.22	632.59	632.96
171	633.33	633.70	634.07	634.44	634.81	635.18	635.55	635.92	636.29	636.66
172	637.04	637.40	637.77	638.14	638.51	638.88	639.25	639.62	639.99	640.37
173	640.74	641.11	641.48	641.85	642.22	642.59	642.96	643.33	643.70	644.07
174	644.44	644.81	645.18	645.55	645.92	646.29	646.66	647.03	647.41	647.78
175	648.15	648.52	648.89	649.26	649.63	650.00	650.37	650.74	651.11	651.48
176	651.85	652.22	652.59	652.96	653.33	653.70	654.07	654.44	654.81	655.18
177	655.56	655.93	656.30	656.67	657.04	657.41	657.78	658.15	658.52	658.89
178	659.26	659.63	660.00	660.37	660.74	661.11	661.48	661.85	662.22	662.59
179	662.96	663.33	663.70	664.07	664.44	664.81	665.18	665.55	665.92	666.29

EXCAVATION AND EMBANKMENT TABLES.

	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
180	666.67	667.04	667.41	667.78	668.15	668.52	668.89	669.26	669.63	670.00
181	670.37	670.74	671.11	671.48	671.85	672.22	672.59	672.96	673.33	673.70
182	674.07	674.44	674.81	675.18	675.55	675.93	676.30	676.67	677.04	677.41
183	677.78	678.15	678.52	678.89	679.26	679.63	680.00	680.37	680.74	681.11
184	681.48	681.85	682.22	682.59	682.96	683.33	684.70	684.07	684.44	684.81
185	685.18	685.56	685.93	686.30	686.67	687.04	687.41	687.78	688.15	688.52
186	688.89	689.26	689.63	690.00	690.37	690.74	691.11	691.48	691.85	692.22
187	692.59	692.96	693.33	693.70	694.07	694.44	694.81	695.18	695.55	695.92
188	696.30	696.67	697.04	697.41	697.78	698.15	698.52	698.89	699.26	699.63
189	700.00	700.37	700.74	701.11	701.48	701.85	702.22	702.59	702.96	703.33
190	703.70	704.07	704.44	704.81	705.18	705.55	705.92	706.29	706.66	707.03
191	707.40	707.77	708.14	708.51	708.89	709.26	709.63	710.00	710.37	710.74
192	711.11	711.48	711.85	712.22	712.59	712.96	713.33	713.70	714.07	714.44
193	714.81	715.18	715.55	715.92	716.29	716.67	717.04	717.41	717.78	718.15
194	718.52	718.89	719.26	719.63	720.00	720.37	720.74	721.11	721.48	721.85
195	722.22	722.59	722.96	723.33	723.70	724.07	724.44	724.81	725.18	725.55
196	725.92	726.29	726.66	727.03	727.40	727.77	728.14	728.51	728.88	729.25
197	729.63	730.00	730.37	730.74	731.11	731.48	731.85	732.22	732.59	732.96
198	733.33	733.70	734.07	734.44	734.81	735.18	735.55	735.93	736.30	736.67
199	737.04	737.41	737.78	738.15	738.52	738.89	739.26	739.63	740.00	740.37
200	740.74	741.11	741.48	741.85	742.22	742.59	742.96	743.33	743.70	744.07
201	744.44	744.81	745.18	745.55	745.93	746.30	746.67	747.04	747.41	747.78
202	748.15	748.52	748.89	749.26	749.63	750.00	750.37	750.74	751.11	751.48
203	751.85	752.22	752.59	752.96	753.33	753.70	754.07	754.44	754.81	755.18
204	755.55	755.93	756.30	756.67	757.04	757.41	757.78	758.15	758.52	758.89
205	759.26	759.63	760.00	760.37	760.74	761.11	761.48	761.85	762.22	762.59
206	762.96	763.33	763.70	764.07	764.44	764.81	765.18	765.55	765.93	766.30
207	766.66	767.04	767.41	767.78	768.15	768.52	768.89	769.26	769.63	770.00
208	770.37	770.74	771.11	771.48	771.85	772.22	772.59	772.96	773.33	773.70
209	774.07	774.44	774.81	775.18	775.55	775.93	776.30	776.66	777.04	777.41
210	777.78	778.15	778.52	778.89	779.26	779.63	780.00	780.37	780.74	781.11
211	781.48	781.85	782.22	782.59	782.96	783.33	783.70	784.07	784.44	784.81
212	785.18	785.55	785.93	786.30	786.66	787.04	787.41	787.78	788.15	788.52
213	788.89	789.26	789.63	790.00	790.37	790.74	791.11	791.48	791.85	792.22
214	792.59	792.96	793.33	793.70	794.07	794.44	794.81	795.18	795.55	795.93
215	796.30	796.66	797.04	797.41	797.78	798.15	798.52	798.89	799.26	799.63
216	800.00	800.37	800.74	801.11	801.48	801.85	802.22	802.59	802.96	803.33
217	803.70	804.07	804.44	804.81	805.18	805.55	805.93	806.30	806.66	807.04
218	807.41	807.78	808.15	808.52	808.89	809.26	809.63	810.00	810.37	810.74
219	811.11	811.48	811.85	812.22	812.59	812.96	813.33	813.70	814.07	814.44
220	814.81	815.18	815.55	815.93	816.30	816.66	817.04	817.41	817.78	818.15
221	818.52	818.89	819.26	819.63	820.00	820.37	820.74	821.11	821.48	821.85
222	822.22	822.59	822.96	823.33	823.70	824.07	824.44	824.81	825.18	825.55
223	825.93	826.30	826.66	827.04	827.41	827.78	828.15	828.52	828.89	829.26
224	829.63	830.00	830.37	830.74	831.11	831.48	831.85	832.22	832.59	832.96
225	833.33	833.70	834.07	834.44	834.81	835.18	835.55	835.93	836.30	836.66
226	837.04	837.41	837.78	838.15	838.52	838.89	839.26	839.63	840.00	840.37
227	840.74	841.11	841.48	841.85	842.22	842.59	842.96	843.33	843.70	844.07
228	844.44	844.81	845.18	845.55	845.93	846.30	846.66	847.04	847.41	847.78
229	848.15	848.52	848.89	849.26	849.63	850.00	850.37	850.74	851.11	851.48
230	851.85	852.22	852.59	852.96	853.33	853.70	854.07	854.44	854.81	855.18
231	855.55	855.93	856.30	856.66	857.04	857.41	857.78	858.15	858.52	858.89
232	859.26	859.63	860.00	860.37	860.74	861.11	861.48	861.85	862.22	862.59
233	862.96	863.33	863.70	864.07	864.44	864.81	865.18	865.55	865.93	866.30
234	866.66	867.04	867.41	867.78	868.15	868.52	868.89	869.26	869.63	870.00
235	870.37	870.74	871.11	871.48	871.85	872.22	872.59	872.96	873.33	873.70
236	874.07	874.44	874.81	875.18	875.55	875.93	876.30	876.66	877.04	877.41
237	877.78	878.15	878.52	878.89	879.26	879.63	880.00	880.37	880.74	881.11
238	881.48	881.85	882.22	882.59	882.96	883.33	883.70	884.07	884.44	884.81
239	885.18	885.55	885.93	886.30	886.66	887.04	887.41	887.78	888.15	888.52

EXCAVATION AND EMBANKMENT TABLES.

	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
240	888.88	889.26	889.63	890.00	890.37	890.74	891.11	891.48	891.85	892.22
241	892.59	892.96	893.33	893.70	894.07	894.44	894.81	895.18	895.55	895.93
242	896.30	896.66	897.04	897.41	897.78	898.15	898.52	898.88	899.26	899.63
243	900.00	900.37	900.74	901.11	901.48	901.85	902.22	902.59	902.96	903.33
244	903.70	904.07	904.44	904.81	905.18	905.55	905.93	906.30	906.66	907.04
245	907.41	907.78	908.15	908.52	908.88	909.26	909.63	910.00	910.37	910.74
246	911.11	911.48	911.85	912.22	912.59	912.96	913.33	913.70	914.07	914.44
247	914.81	915.18	915.55	915.93	916.30	916.66	917.04	917.41	917.78	918.15
248	918.52	918.88	919.26	919.63	920.00	920.37	920.74	921.11	921.48	921.85
249	922.22	922.59	922.96	923.33	923.70	924.07	924.44	924.81	925.18	925.55
250	925.92	926.30	926.66	927.04	927.41	927.78	928.15	928.52	928.88	929.26
251	929.63	930.00	930.37	930.74	931.11	931.48	931.85	932.22	932.59	932.96
252	933.33	933.70	934.07	934.44	934.81	935.18	935.55	935.92	936.30	936.66
253	937.04	937.41	937.78	938.15	938.52	938.88	939.26	939.63	940.00	940.37
254	940.74	941.11	941.48	941.85	942.22	942.59	942.96	943.33	943.70	944.07
255	944.44	944.81	945.18	945.55	945.92	946.30	946.66	947.04	947.41	947.78
256	948.15	948.52	948.88	949.26	949.63	950.00	950.37	950.74	951.11	951.48
257	951.85	952.22	952.59	952.96	953.33	953.70	954.07	954.44	954.81	955.18
258	955.55	955.92	956.30	956.66	957.04	957.41	957.78	958.15	958.52	958.88
259	959.26	959.63	960.00	960.37	960.74	961.11	961.48	961.85	962.22	962.59
260	962.96	963.33	963.70	964.07	964.44	964.81	965.18	965.55	965.92	966.30
261	966.66	967.04	967.41	967.78	968.15	968.52	968.88	969.26	969.63	970.00
262	970.37	970.74	971.11	971.48	971.85	972.22	972.59	972.96	973.33	973.70
263	974.07	974.44	974.81	975.18	975.55	975.92	976.30	976.66	977.04	977.41
264	977.78	978.15	978.52	978.88	979.26	979.63	980.00	980.37	980.74	981.11
265	981.48	981.85	982.22	982.59	982.96	983.33	983.70	984.07	984.44	984.81
266	985.18	985.55	985.92	986.30	986.66	987.04	987.41	987.78	988.15	988.52
267	988.88	989.26	989.63	990.00	990.37	990.74	991.11	991.48	991.85	992.22
268	992.59	992.96	993.33	993.70	994.07	994.44	994.81	995.18	995.55	995.92
269	996.30	996.66	997.04	997.41	997.78	998.15	998.52	998.88	999.26	999.63
270	1000.00	1000.37	1000.74	1001.11	1001.48	1001.85	1002.22	1002.59	1002.96	1003.33
271	1003.70	1004.07	1004.44	1004.81	1005.18	1005.55	1005.92	1006.30	1006.66	1007.04
272	1007.41	1007.78	1008.15	1008.52	1008.88	1009.26	1009.63	1010.00	1010.37	1010.74
273	1011.11	1011.48	1011.85	1012.22	1012.59	1012.96	1013.33	1013.70	1014.07	1014.44
274	1014.81	1015.18	1015.55	1015.92	1016.30	1016.66	1017.04	1017.41	1017.78	1018.15
275	1018.52	1018.88	1019.26	1019.63	1020.00	1020.37	1020.74	1021.11	1021.48	1021.85
276	1022.22	1022.59	1022.96	1023.33	1023.70	1024.07	1024.44	1024.81	1025.18	1025.55
277	1025.92	1026.30	1026.66	1027.04	1027.41	1027.78	1028.15	1028.52	1028.88	1029.26
278	1029.63	1030.00	1030.37	1030.74	1031.11	1031.48	1031.85	1032.22	1032.59	1032.96
279	1033.33	1033.70	1034.07	1034.44	1034.81	1035.18	1035.55	1035.92	1036.30	1036.66
280	1037.04	1037.41	1037.78	1038.15	1038.52	1038.88	1039.26	1039.63	1040.00	1040.37
281	1040.74	1041.11	1041.48	1041.85	1042.22	1042.59	1042.96	1043.33	1043.70	1044.07
282	1044.44	1044.81	1045.18	1045.55	1045.92	1046.30	1046.66	1047.04	1047.41	1047.78
283	1048.15	1048.52	1048.88	1049.26	1049.63	1050.00	1050.37	1050.74	1051.11	1051.48
284	1051.85	1052.22	1052.59	1052.96	1053.33	1053.70	1054.07	1054.44	1054.81	1055.18
285	1055.55	1055.92	1056.30	1056.66	1057.04	1057.41	1057.78	1058.15	1058.52	1058.88
286	1059.26	1059.63	1060.00	1060.37	1060.74	1061.11	1061.48	1061.85	1062.22	1062.59
287	1062.96	1063.33	1063.70	1064.07	1064.44	1064.81	1065.18	1065.55	1065.92	1066.30
288	1066.66	1067.04	1067.41	1067.78	1068.15	1068.52	1068.88	1069.26	1069.63	1070.00
289	1070.37	1070.74	1071.11	1071.48	1071.85	1072.22	1072.59	1072.96	1073.33	1073.70
290	1074.07	1074.44	1074.81	1075.18	1075.55	1075.92	1076.30	1076.66	1077.04	1077.41
291	1077.78	1078.15	1078.52	1078.88	1079.26	1079.63	1080.00	1080.37	1080.74	1081.11
292	1081.48	1081.85	1082.22	1082.59	1082.96	1083.33	1083.70	1084.07	1084.44	1084.81
293	1085.18	1085.55	1085.92	1086.30	1086.66	1087.04	1087.41	1087.78	1088.15	1088.52
294	1088.88	1089.26	1089.63	1090.00	1090.37	1090.74	1091.11	1091.48	1091.85	1092.22
295	1092.59	1092.96	1093.33	1093.70	1094.07	1094.44	1094.81	1095.18	1095.55	1095.92
296	1096.30	1096.66	1097.04	1097.41	1097.78	1098.15	1098.52	1098.88	1099.26	1099.63
297	1100.00	1100.37	1100.74	1101.11	1101.48	1101.85	1102.22	1102.59	1102.96	1103.33
298	1103.70	1104.07	1104.44	1104.81	1105.18	1105.55	1105.92	1106.30	1106.66	1107.04
299	1107.41	1107.78	1108.15	1108.52	1108.88	1109.26	1109.63	1110.00	1110.37	1110.74

EXCAVATION AND EMBANKMENT TABLES.

	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
300	1111.11	1111.48	1111.85	1112.22	1112.59	1112.96	1113.33	1113.70	1114.07	1114.44
301	1114.82	1115.19	1115.56	1115.93	1116.30	1116.67	1117.04	1117.41	1117.78	1118.15
302	1118.52	1118.89	1119.26	1119.63	1120.00	1120.37	1120.74	1121.11	1121.48	1121.85
303	1122.22	1122.59	1122.96	1123.33	1123.70	1124.07	1124.44	1124.82	1125.19	1125.56
304	1125.93	1126.30	1126.67	1127.04	1127.41	1127.78	1128.15	1128.52	1128.89	1129.26
305	1129.63	1130.00	1130.37	1130.74	1131.11	1131.48	1131.85	1132.22	1132.59	1132.96
306	1133.33	1133.70	1134.07	1134.44	1134.82	1135.19	1135.56	1135.93	1136.30	1137.67
307	1137.04	1137.41	1137.78	1138.15	1138.52	1138.89	1139.26	1139.63	1140.00	1140.37
308	1140.74	1141.11	1141.48	1141.85	1142.22	1142.59	1142.96	1143.33	1143.70	1144.07
309	1144.44	1144.82	1145.19	1145.56	1145.93	1146.30	1146.67	1147.04	1147.41	1147.78
310	1148.15	1148.52	1148.89	1149.26	1149.63	1150.00	1150.37	1150.74	1151.11	1151.48
311	1151.85	1152.22	1152.59	1152.96	1153.33	1153.70	1154.07	1154.44	1154.82	1155.19
312	1155.56	1155.93	1156.30	1156.67	1157.04	1157.41	1157.78	1158.15	1158.52	1158.89
313	1159.26	1159.63	1160.00	1160.37	1160.74	1161.11	1161.48	1161.85	1162.22	1162.59
314	1162.96	1163.33	1163.70	1164.07	1164.44	1164.82	1165.19	1165.56	1165.93	1166.30
315	1166.67	1167.04	1167.41	1167.78	1168.15	1168.52	1168.89	1169.26	1169.63	1170.00
316	1170.37	1170.74	1171.11	1171.48	1171.85	1172.22	1172.59	1172.96	1173.33	1173.70
317	1174.07	1174.44	1174.82	1175.19	1175.56	1175.93	1176.30	1176.67	1177.04	1177.41
318	1177.78	1178.15	1178.52	1178.89	1179.26	1179.63	1180.00	1180.37	1180.74	1181.11
319	1181.48	1181.85	1182.22	1182.59	1182.96	1183.33	1183.70	1184.07	1184.44	1184.82
320	1185.19	1185.56	1185.93	1186.30	1186.67	1187.04	1187.41	1187.78	1188.15	1188.52
321	1188.89	1189.26	1189.63	1190.00	1190.37	1190.74	1191.11	1191.48	1191.85	1192.22
322	1192.59	1192.96	1193.33	1193.70	1194.07	1194.44	1194.82	1195.19	1195.56	1195.93
323	1196.30	1196.67	1197.04	1197.41	1197.78	1198.15	1198.52	1198.89	1199.26	1199.63
324	1200.00	1200.37	1200.74	1201.11	1201.48	1201.85	1202.22	1202.59	1202.96	1203.33
325	1203.70	1204.07	1204.44	1204.82	1205.19	1205.56	1205.93	1206.30	1206.67	1207.04
326	1207.41	1207.78	1208.15	1208.52	1208.89	1209.26	1209.63	1210.00	1210.37	1210.74
327	1211.11	1211.48	1211.85	1212.22	1212.59	1212.96	1213.33	1213.70	1214.07	1214.44
328	1214.82	1215.19	1215.56	1215.93	1216.30	1216.67	1217.04	1217.41	1217.78	1218.15
329	1218.52	1218.89	1219.26	1219.63	1220.00	1220.37	1220.74	1221.11	1221.48	1221.86
330	1222.22	1222.59	1222.96	1223.33	1223.70	1224.07	1224.44	1224.81	1225.18	1225.55
331	1225.93	1226.30	1226.67	1227.04	1227.41	1227.78	1228.15	1228.52	1228.89	1229.26
332	1229.63	1230.00	1230.37	1230.74	1231.11	1231.48	1231.85	1232.22	1232.59	1232.96
333	1233.33	1233.70	1234.07	1234.44	1243.82	1235.19	1235.56	1235.93	1236.30	1236.67
334	1237.04	1237.41	1237.78	1238.15	1238.52	1238.89	1239.26	1239.63	1240.00	1240.37
335	1240.74	1241.11	1241.48	1241.85	1242.22	1242.59	1242.96	1243.33	1243.70	1244.07
336	1244.44	1244.82	1245.19	1245.56	1245.93	1246.30	1246.67	1247.04	1247.41	1247.78
337	1248.15	1248.52	1248.89	1249.26	1249.63	1250.00	1250.37	1250.74	1251.11	1251.48
338	1251.85	1252.22	1252.59	1252.96	1253.33	1253.70	1254.07	1254.44	1254.82	1255.19
339	1255.56	1255.93	1256.30	1256.67	1257.04	1257.41	1257.73	1258.15	1258.52	1258.89
340	1259.26	1259.63	1260.00	1260.37	1260.74	1261.11	1261.48	1261.85	1262.22	1262.59
341	1262.96	1263.33	1263.70	1264.07	1264.44	1264.82	1265.19	1265.56	1265.93	1266.30
342	1266.67	1267.04	1267.41	1267.78	1268.15	1268.52	1268.89	1269.26	1269.63	1270.00
343	1270.37	1270.74	1271.11	1271.48	1271.85	1272.22	1272.59	1272.96	1273.33	1273.70
344	1274.07	1274.44	1274.82	1275.19	1275.56	1275.93	1276.30	1276.67	1277.04	1277.41
345	1277.78	1278.15	1278.52	1278.89	1279.26	1279.63	1280.00	1280.37	1280.74	1281.11
346	1281.48	1281.85	1282.22	1282.59	1282.96	1283.33	1283.70	1284.07	1284.44	1284.82
347	1285.19	1285.56	1285.93	1286.30	1286.67	1287.04	1287.41	1287.78	1288.15	1288.52
348	1288.89	1289.26	1289.63	1290.00	1290.37	1290.74	1291.11	1291.48	1291.85	1292.22
349	1292.59	1292.96	1293.33	1293.70	1294.07	1294.44	1294.82	1295.19	1295.56	1295.93
350	1296.30	1296.67	1297.04	1297.41	1297.78	1298.15	1298.52	1298.89	1299.26	1299.63
351	1300.00	1300.37	1300.74	1301.11	1301.48	1301.85	1302.22	1302.59	1302.96	1303.33
352	1303.70	1304.07	1304.44	1304.82	1305.19	1305.56	1305.93	1306.30	1306.67	1307.04
353	1307.41	1307.78	1308.15	1308.52	1308.89	1309.26	1309.63	1310.00	1310.37	1310.74
354	1311.11	1311.48	1311.85	1312.22	1312.59	1312.96	1313.33	1313.70	1314.07	1314.44
355	1314.82	1315.19	1315.56	1315.93	1316.30	1316.67	1317.04	1317.41	1317.78	1318.15
356	1318.52	1318.89	1319.26	1319.63	1320.00	1320.37	1320.74	1321.11	1321.48	1321.86
357	1322.22	1322.59	1322.96	1323.33	1323.70	1324.07	1324.44	1324.81	1325.18	1325.55
358	1325.93	1326.30	1326.67	1327.04	1327.41	1327.78	1328.15	1328.52	1328.89	1329.26
359	1329.63	1330.00	1330.37	1330.74	1331.11	1331.48	1331.85	1332.22	1332.59	1332.96

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